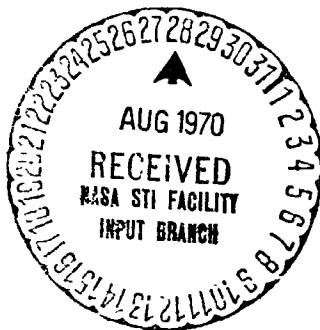


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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION



# TRANSLUNAR, LUNAR PARKING ORBIT, AND TRANSEARTH PROCEDURES

## C-PRIME MISSION

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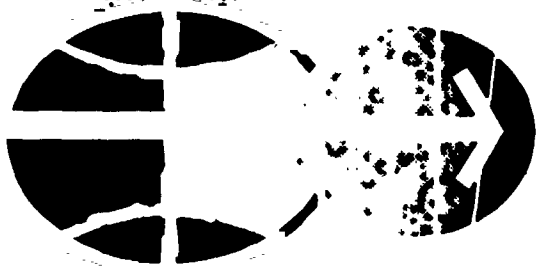
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TRANSLUNAR, LUNAR PARKING ORBIT, AND  
TRANSEARTH PROCEDURES

C-PRIME MISSION

AS-503/CSM-103  
12 November 1968

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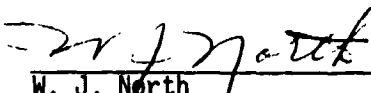
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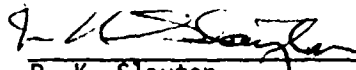
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## 1.0 PURPOSE

This document contains the nominal primary crew procedures for the CSM-103 spacecraft during the lunar Mission C-Prime. The specific time period covered by these procedures is from CSM/S-IVB separation at 3:20 GET through the last TEMCC (MCC7) at 144:50 GET.

The purpose of the Translunar, Lunar Parking Orbit and Transearth procedures document is to provide a single source of guidance, navigation and control procedures information for use in flight planning, in crew training, and in preparation of onboard checklists.

This document is a control document for this phase of the Mission C-Prime nominal crew procedures. Revisions to this document are subject to approval by the Procedures Configuration Control Board. Comments should be directed to Mr. Duane K Mosel, Flight Procedures Branch, Extension 5340 or to Stephen G. Paddock, Jr., Apollo Flight Crew Support Group, Houston Operations, McDonnell Douglas Astronautics Company, Extension 6101.

## 2.0 LIST OF ACRONYMS AND ABBREVIATIONS

AOS	Acquisition of Signal
ATT	Attitude
BEF	Blunt End Forward
CB	Circuit Breaker
CDR	Commander
CM	Command Module
CMC	Command Module Computer
CMP	Command Module Pilot
COAS	Crew Optical Alignment Sight
CSM	Command and Service Module
DAP	Digital Autopilot
DB	Deadband
DSKY	Display and Keyboard
DV	Delta Velocity
EMS	Entry Monitor System
ET	Event Timer
FDAI	Flight Director Attitude Indicator
FPS	Feet Per Second
GDC	Gyro Display Coupler
GETI	Ground Elapsed Time of Ignition
GMBL	Gimbal
GND	Ground
GPI	Gimbal Position Indicator
HA	Apogee Altitude
HOR	Horizon
HP	Perigee Altitude
IMU	Inertial Measurement Unit
LEB	Lower Equipment Bay

LOS	Loss of Signal
LM	Lunar Module
LMK	Landmark
LMP	Lunar Module Pilot
LOI	Lunar Orbit Injection
LV	Launch Vehicle
MDC	Main Display Console
MGA	Middle Gimbal Angle
MTVC	Manual Thrust Vector Control
OPT	Optics
ORDEAL	Orbital Rate Drive Earth and Lunar
OSS	Optical Subsystem
PAD	Data Voiced to Crew From Ground
PB	Pushbutton
PGNCS	Primary Guidance, Navigation, and Control System
PIPA	Pulse Integrating Pendulous Accelerometers
R	Range
R DOT	Range Rate
REFSMMAT	Reference Stable Member Matrix
RCS	Reaction Control System
RHC	Rotation Hand Controller
S-IVB	Saturn S-IVB Stage
SCS	Stabilization and Control System
SCT	Scanning Telescope
SECS	Sequence Events Control System
SEF	Small End Forward
SEP	Separation
SM	Service Module
SPS	Service Propulsion System
SC	Spacecraft



- 4 -

S/U	Setup
SXT	Sextant
TEMCC	Transearch Midcourse Correction
TFI	Time From Ignition
THC	Translation Hand Controller
THETA	Angle Between SC +X Axis and Local Horizontal
TIGN	Time of Ignition
TLI	Translunar Injection
TEI	Transearch Injection
TLM	Telemetry
TLMCC	Translunar Midcourse Correction
TRUN	Trunnion
TVC	Thrust Vector Control
VG	Velocity to be Gained
(XX:XX)	Indicates ground elapsed time from liftoff in hours: minutes

### 3.0 NOMINAL MISSION PROCEDURES

The nominal Mission C-Prime Translunar, Lunar Parking Orbit, and Transearth flight crew procedures presented in this document are divided into two sections, a major activities timeline and standard procedures. The timeline identifies all guidance, navigation, and control related activities as a function of GET. The procedures necessary to successfully perform an activity required only once during the mission, e.g. CSM/S-IVB separation, are presented in detail within the timeline. Whereas, the procedures for an activity reoccurring periodically throughout the mission, e.g. an IMU alignment, are presented in detail in an addendum to avoid repetition. The timeline identifies how and when the standard procedure should be applied and the standard procedure is sufficiently flexible to cover any option required during the mission.

#### 3.1 Major Activities

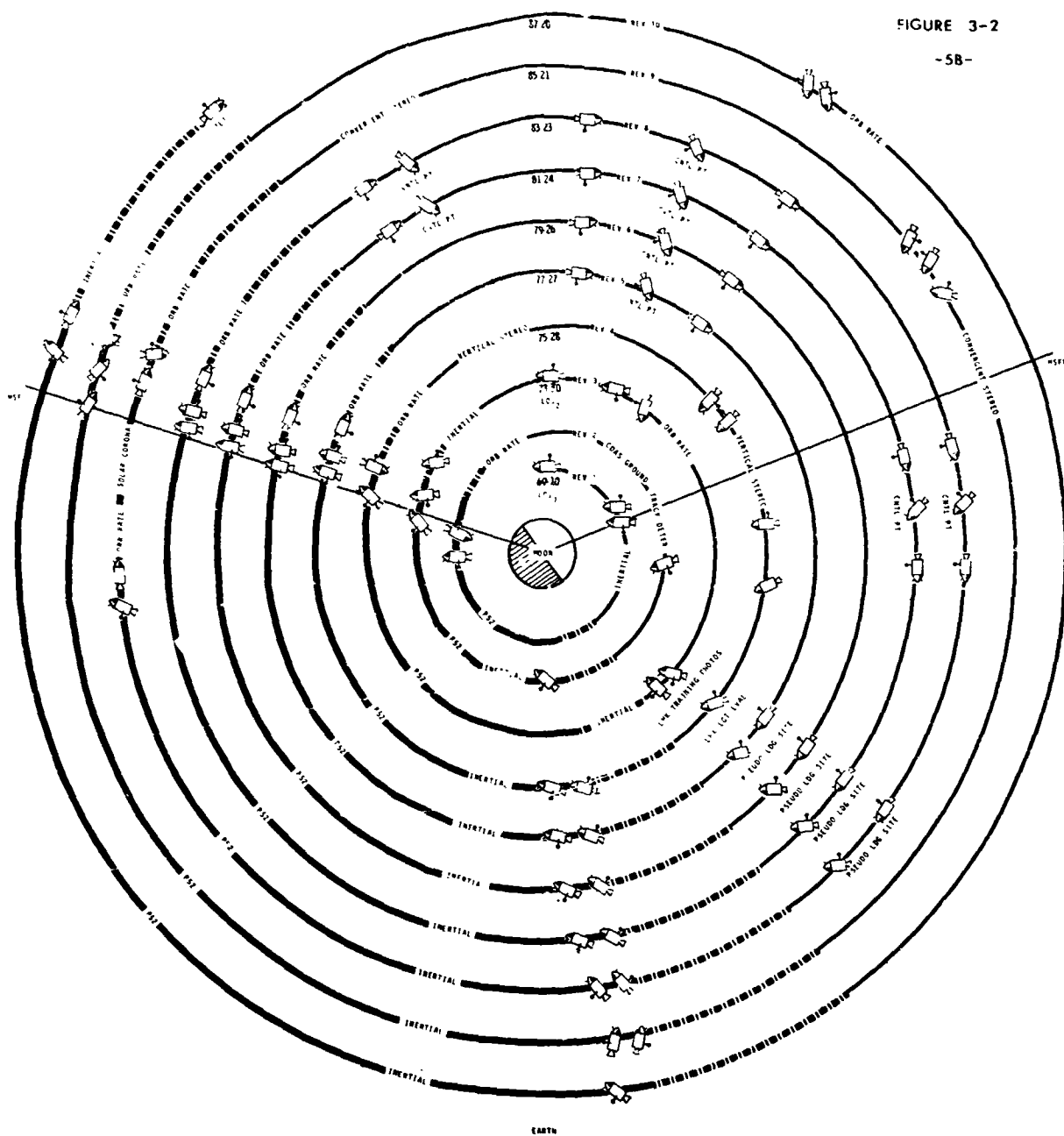
##### 3.1.1 Introduction

The major procedures timeline for the Mission C-Prime includes activities from after the TLI (2:51 GET) through the last Transearth midcourse correction (144:50 GET). Figure 3-1 shows the locations in time and approximate positions in space of selected major activities during the Translunar and Transearth phases. Figure 3-2 is a CSM attitude profile for the Lunar Parking Orbit phase. The nominal Mission C-Prime timeline assumes a 21 December 1968 launch, a 72 degree launch azimuth, and a nominal TLI ignition time of 02:50:31 GET.

The procedures presented in this document include primarily guidance, navigation, and control functions. Management of other systems, such as electrical power and environmental control are recommended as identified in Reference (1).



-5B-



PROCEDURES FOR CSM/S-IVR SEP  
(ASSUMES P47 BEING MONITORED)

# MISSION C-PRIME PROCEDURES

T1 T TO CM/CM SEP

## MAJOR PROCEDURE TIME LINE

\*\*\*\*\*

CDB SET FT=5A+00 (COUNT UP)

(DVX, DUY, DVZ)

FD-302 (Rev. 1-25-60)

167331 NOV

1511

AT 17H-1

MOJ-347H

CDR TRANS CONT PWR-ON(UP)

# CHC PWR D18

SC CONT-CMC

CMC MONTE-FRÈRE

AMAG MONF(3)-RATE2

V1150 PCS SEI (14) -MNA

035010-1107303 50 K263:

930077-17741E03 HJ A.F.H3A

131007 SCH WJ A-FIRMA

TVC SERVON PWR I-AL1/MNA

**EDS PWR-ON(UP)**

**VERIFY LV ENG LT-ON**

**FDAI/SW(ROTH) (ORDEAL) - INER**

(15+20)

## TRANSILINAR INJECTION

ASSUMED PRE-CSM/S-TVB SEPARATION  
SWITCH POSITIONS AND DAP  
CONFIGURATION  
(ADDENDUM 1)

(03007)  
CMP LOAD N17 WITH SEP ATTITUDE  
KEY V63E  
CNR MONITOR S-IVH MANFUVER TO  
INERTIAL SEP ATTITUDE

(03-14)

**CDB START ET COUNT UP**

**THC-ARMED**

**PHC-ADMFD**

Q3501-C-A 035 250

[illegible][illegible]

0360725 (H10H) MAY 57 15 03

1401 N 02 (A109) 21907 5325

REPORT LOGIC ARM TO GND

RECEIVE GO FROM GND

**NON-ESS BUS-MNA**

**FLY RCOR-RECORD**

## TLM INPUTS PCM-HIGH

THEY CAN GET THEM NOW

TAFE 0000 BCM-BCM/ANIG

# TYPE WITH POWER

6

FINAL MISSION C-PRIME TRANSLUNAR, L, NAR PARKING ORBIT, AND TRANSEARTH TIMELINE -12 NOV 1968

TIME	EVENT	STATUS	REMARKS
-1MIN	CDR SECS PYRO ARM(ROTH)-ON(UP)	0	
	CM RCS LOGIC-ON(UP)	1	
	RCS CMD-ON	2	
	CDR KEY V60E (N17=N20)	1	
	CDR EMS FUNCTION-DV	1	
	FMS MONE-AUTO	1	
	CMC MONE-HOLD		
-2SEC	THC-THRUST(+)X AND HOLD (PRESEP TENSION)		
(03+20)	CSM/LV SEP PB-PUSH AND HOLD	1	
-0SEC	VERIFY LV ENG 1 LT-OFF	1	
	CSM/LV SEP PB-RELEASE	1	
+5SEC	THC-RELEASE		
	VERIFY EMS DV IND READS 1FPS (APPROXIMATE)		
	MAINTAIN INERTIAL SEP ATT USING FOAI		
	RMC PWR DIRECT(ROTH)-OFF	1	
	CM RCS LOGIC-OFF	1	
	EDS PWR-OFF	7	
	TVC SERVO PWR 1-OFF	7	
	SECS LOGIC(BOTH)-OFF	8	
	SECS PYRO ARM(ROTH)-SAFE	8	
	CB SECS ARM(ROTH)-OPEN	8	
	CB SECS LOGIC(ROTH)-OPEN	8	
	CH RCS LOGIC-OPEN	8	
+40SEC	LMP FLT PCDR-OFF(CTR)		
	TAPE RCDR FWD-OFF(CTR)		
	NONESS RUS-OFF		
+1MIN	CDR THC-THRUST(-)X FOR 5SEC		
	EMS MODE-STBY		
	EMS FUNCTION-OFF		
	PRO		
	F 37 BB		
	P00		
	KEY 00E		
-2SEC	CDR CMC MODE-AUTO		
	HMAC MODE(3)-RATE2		
	MAN ATT(3)-RATE CMD		
	CMC KEY V16 N20E		
	16 20 (CURRENT R.P.Y)		
	COPY CURRENT R.P.Y		
	COMPUTE COMMANDED R.P.Y FOR 180 DEG PITCH AND 60 DEG ROLL LEFT ATT MANEUVER		
	PRO		
	KEY V49E		
	F 06 22 (COMMANDED R.P.Y)		
	LOAD COMPUTED R.P.Y		
	KEY V62E		
	PRO		
	F 50 18 (COMMANDED R.P.Y)		
	PRO		
	06 18 (COMMANDED R.P.Y)		
	MONITOR ATT MANEUVER		
	OBSERVE S-IVR IN CMD WINDOW		

F 50 18 (COMMANDED R.P.Y)  
KEY ENTER

F 04 46 (DAP CONFIGURATION)  
KEY V48E  
LOAD 11102 (MIN DR,LOW RATE)  
11111  
B

F 06 47 (CSM AND LM WT)  
VERIFY PAD DATA  
PRO

F 06 47 (SPS GMBL TRIM)  
VERIFY PAD DATA  
PRO

(03,24) CDR PERFORM FORMATION FLYING  
AT 50 TO 100 FT  
TAKE PHOTOGRAPHS OF S-IVR

(03,30) PROCEDURES FOR CSM EVASIVE  
MANEUVER

P00 CMP WHEN COMP LT-OUT(NO INTEG,  
KEY V96E  
KEY V83E  
F 16 54 (R,RDOT,THETA)  
CDR MAN ATT(3)-ACC CMD  
MANEUVER SC TO LOCAL  
VERTICAL(+X AXIS TOWARD  
EARTH) WHILE TRANSLATING TO  
MAINTAIN S-IVR IN CMD WINDOW

ATT 09-MIN 1  
RATE-LOW 1  
MAN ATT(3)-RATE CMD 1  
HOLD LOCAL VERTICAL ATTITUDE  
(DSKY THETA APPROX 270 DEG)  
WITH S-IVB BETWEEN SC  
AND EARTH  
CMF PRO

P47 F 16 83 (DVX,DVY,DVZ)  
KEY V37E47E

CDR 8MAG MODE(3)-ATT1/RATE2  
EMS FUNCTION=DV  
EMS MODE-AUTO

(03,35) THC=THRUST AFT (-X) UNTIL  
DSKY READS 1.5FPS  
VERIFY S-IVB RANGE OPENING  
VISUALLY  
THC=LOCKED  
PITCH UP FOR MSFN COVERAGE  
CMP PRO  
F 37 88

P00 KEY 00E  
KEY V66E (TRANSFER CSM SV  
FROM CSM SLOTS TO LM SLOTS)  
KEY V48E  
F 04 46 (DAP CONFIGURATION)  
LOAD 11112 (MAX DB,LOW RATE)  
11111

B

F 06 47 (CSM AND LM WT)  
VERIFY PAD DATA  
PRO  
F 06 48 (SPS GMBL TRIM)  
VERIFY PAD DATA  
PRO

CNR MONITOR SC INERTIAL ATTITUDE  
HOLD UNTIL APPROX (04+00)

(04+00) PROCEDURES FOR IMU REALIGN  
TO REFMMAT  
(ADDENDUM 2) (P52)

BACKUP ALIGN NAV STARS  
NO. 14 (CANOPUS)  
NO. 12 (RIGEL)  
BACKUP ALIGN CHECK NAV STAR  
NO. 15 (SIRIUS)

(04+15) PROCEDURES FOR GDC ALIGN TO IMU  
(ADDENDUM 3)

(04+20) PROCEDURES FOR STAR/EARTH  
HORIZON SIGHTINGS - 5 SETS  
OF 3 MARKS EACH  
(ADDENDUM 4) (P23)

RECOMMENDED NAV STARS  
NO. 14 (CANOPUS) (FAR HOR)  
NO. 15 (SIRIUS) (FAR HOR)

NO. 15 (SIRIUS) (FAR HOR)  
NO. 15 (PROCYON) (FAR HOR)  
NO. 16 (PROCYON) (FAR HOR)

(05+00) LMP RECEIVE BLOCK DATA PAD  
FROM GND

(05+20) PROCEDURES FOR LOI POSITION  
DETERMINATION  
(ADDENDUM 5) (P21)

(05+40) PROCEDURES FOR HI GAIN PWR UP

P00 LMP CB HI GAIN ANT 225  
FLT BUS-CLOSED 225  
GRP 2-CLOSED 2  
HI GAIN ANT TRACK-MAN 2  
HI GAIN ANT SERVO ELEC-PRIM 2  
HI GAIN ANT BEAM-WIDE 2  
HI GAIN ANT PWR-POWER 2

CMP KEY V64E  
F 06 51 (RHO, GAMMA, BLANK)  
LMP RECORD HI GAIN ANT  
GMBL COORDINATES  
CMP PRO

LMP HI GAIN ANT POSITION 2  
SET ANT PITCH TO RHO 2  
SET ANT YAW TO GAMMA 2  
S-BAND ANT OMNI-HI GAIN 3  
VERIFY HI GAIN ANT S-BAND  
ANT IND GREATER THAN  
HALF SCALE 2  
HI GAIN ANT TRACK-AUTO 2

FINAL MISSION C-PRIME TRANSLUNAR, LUNAR PARKING ORBIT, AND TRANSEARTH TIMELINE - 12 NOV 1968



HI GAIN ANT REAM-AS REQUIRED  
PERFORM HI GAIN ANT CHECK-OUT

(07+30)

PROCEDURES FOR GDC DRIFT CHECK  
(ADDENDUM 7)

(07+40)

PROCEDURES FOR IMU REALIGN TO  
REFSMAT FOR DRIFT CHECK  
(ADDENDUM 2) (P52)

RACKUP ALIGN NAV STARS

NO. 14 (CANOPUS)

NO. 12 (RIGEL)

RACKUP ALIGN CHECK NAV STAR

NO. 15 (SIRIUS)

(07+55)

PROCEDURES FOR GDC ALIGN TO I.U  
(ADDENDUM 3)

(08+00)

PROCEDURES FOR GND UPLINK OF CSM  
STATE VECTOR AND P30 TARGET (OAN  
(ADDENDUM 4) (P27)

FOLLOWING GND UPLINK

P00

LEB WHEN COMP LT-OUT (NO INTEG)  
KEY V96E

KEY V03E

F 16 54 (R+DOT, THETA)

COPY R AND RDOT

PRO

F 04 06 (TRACK AXIS OPTION)  
LOAD 00002 IN R2

PRO

F 06 18 (COMPUTED R,P,Y)

COPY R,P,Y

KEY V34E

KEY V37E00E

KEY V47E (TRANSFER CSM SV  
FROM LM SLOTS TO CSM SLOTS)

(08+20)

PROCEDURES FOR EXT DV TARGETING  
(ADDENDUM 9) (P30)

\*\*\*\*\*

PROPULSION SYSTEM SELECTION

USE RCS FOR DV GREATER THAN  
1FPS AND LESS THAN OR EQUAL  
TO 5FPS

USE SPS FOR DV GREATER THAN  
5FPS

TRIM DVS TO ZERO

\*\*\*\*\*

(08+25)

PROCEDURES FOR SM RCS PROPULSION  
MONITOR CHECK  
(ADDENDUM 10)

(08+30)

PROCEDURES FOR SPS THRUST SETUP  
(ADDENDUM 11) (P40)

(09+00)	FIRST TRANSLUNAR MIDCOURSE	(17+05)	PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)
(09+05)	PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECK (ADDENDUM 10)	(17+10)	PROCEDURES FOR IMU REALIGN TO REFSMMAT (ADDENDUM 2) (P52)
(09+10)	PROCEDURES FOR STAR/EARTH LANDMARK SIGHTINGS - 3 SFTS OF 3 MARKS EACH (ADDENDUM 4) (P23)		BACKUP ALIGN NAV STARS NO. 14(CANOPUS) NO. 12(RIGEL) BACKUP ALIGN CHECK NAV STAR NO. 15(SIRIUS)
	RECOMMENDED NAV STARS NO. 15(SIRIUS) NO. 15(SIRIUS) NO. 16(PROCYON) RECOMMENDED LANDMARK NO. 5(ALTERNATES-7,10,20,32, 40,41,56,69,70,100, 115,127,128)	(17+25)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)
(09+50)	PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5) (P21)	(17+30)	PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 5 SETS OF 3 MARKS EACH (ADDENDUM 4) (P23)
(09+55)	PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)		RECOMMENDED NAV STARS NO. 22(REGULUS)(FAR MOR) NO. 22(REGULUS)(FAR MOR) NO. 16(PROCYON)(FAR MOR) NO. 16(PROCYON)(FAR MOR) NO. 16(PROCYON)(FAR MOR)
(12+00)	LMP RECEIVE BLOCK DATA PAD FROM GND	(18+20)	PROCEDURES FOR LOI POSITION DETERMINATION

(18+25)	(ADDENDUM 5)	(P21)	NO. 16 (PROCYON) (FAR HOR) NO. 22 (REGULUS) (FAR HOR) NO. 24 (SPICA) (NEAR HOR)
(25+10)	PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)	(24+50)	PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5) (P21)
(25+55)	LMP RECEIVE BLOCK DATA PAD FROM GND	(27+00)	PROCEDURES FOR GND UPLINK OF CSM STATE VECTOR AND P30 TARGET LOAD (ADDENDUM 8) (P27)
(26+00)	PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)		FOLLOWING GND UPLINK
	PROCEDURES FOR IMU REALIGN TO REFSMMAT (ADDENDUM 2) (P52)	P00	LER WHEN COMP LT-OUT (NO INTEG) KEY V96E KEY V83E F 16 54 (R, ROOT, THETA) COPY R AND ROOT PRN
	RACKUP ALIGN NAV STARS NO. 14 (CANOPUS) NO. 12 (RIGEL) RACKUP ALIGN CHECK NAV STAR NO. 15 (SIRIUS)		KEY V89E F 04 06 (TRACK AXIS OPTION) LOAD 00002 IN R2 PRO F 06 18 (COMPUTED R.P.Y) COPY R.P.Y KEY V34E
(26+15)	PROCEDURES FOR GNC ALIGN TO I.U (ADDENDUM 3)		KEY V37E00E
(26+20)	PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 3 SETS OF 3 MARKS EACH (ADDENDUM 4) (P29)	P00	KEY V47E (TRANSFER CSM SV FROM LM SLOTS TO CSM SLOTS)
	RECOMMENDED NAV STARS		

(27+30)

PROCEDURES FOR EXT DV TARGETING  
(ADDENDUM 9) (P30)

\*\*\*\*\*  
PROPULSION SYSTEM SELECTION  
USE RCS FOR DV GREATER THAN  
1FPS AND LESS THAN OR EQUAL  
TO 5FPS (A DV GREATER THAN  
5FPS REQUIRES SCHEDULING THE  
MIDCOURSE AT THE EARLIEST  
POSSIBLE TIME. HENCE THE SPS  
SHOULD NOT BE REQUIRED FOR  
THIS MIDCOURSE CORRECTION)

TRIM DVS TO ZERO

\*\*\*\*\*

(27+35)

PROCEDURES FOR SM RCS PROPULSION  
MONITOR CHECK  
(ADDENDUM 10)

(27+40)

PROCEDURES FOR RCS THRUST SETUP  
(ADDENDUM 12) (P41)

(28+00)

SECOND TRANSLUNAR MIDCOURSE

(28+05)

PROCEDURES FOR SM RCS AND SPS  
PROPULSION MONITOR  
(ADDENDUM 10)

(28+20)

\*\*\*\*\*

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Original Document

FINAL MISSION C-PRIME TRANSLUNAR LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE -12 NOV 1968

PROCEDURES FOR STAR/EARTH  
HORIZON SIGHTINGS - 4 SETS  
OF 3 MARKS EACH  
(ADDENDUM 4) (P23)

RECOMMENDED NAV STARS  
NO. 16 (PROCYON) (FAR HOR)  
NO. 22 (REGULUS) (FAR HOR)  
NO. 21 (ALPHARD) (FAR HOR)  
NO. 26 (SPICA) (NEAR HOR)  
(NO. 21 (ALPHARD) HAS  
MAG 2.2 AND MAY NOT BE  
VISIBLE. IF NOT SELECT  
NO. 22 (REGULUS))

(29+00)

PROCEDURES FOR LOI POSITION  
DETERMINATION  
(ADDENDUM 5) (P21)

(29+05)

PROCEDURES FOR ESTABLISHING PTC  
(ADDENDUM 13)

(31+55)

PROCEDURES FOR TERMINATING PTC  
(ADDENDUM 14)

(34+00)

PROCEDURES FOR IMU REALIGN  
TO REFSMMAT  
(ADDENDUM 2) (P52)

BACKUP ALIGN STARS  
NO. 14 (CANOPUS)  
NO. 12 (RIGEL)

(34+15)	BACKUP ALIGN CHECK NAV STAR NO. 15(SIRIUS)	PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)
(34+20)	PROCEDURES FOR GNC ALIGN TO IMU (ADDENDUM 3)	(44+40) PROCEDURES FOR IMU REALIGN TO REFSMAY (ADDENDUM 2) (P52)
	PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 3 SETS OF 3 MARKS EACH (ADDENDUM 4) (P21)	BACKUP ALIGN STARS NO. 14(CANOPUS) NO. 12(RIGEL) BACKUP ALIGN CHECK NAV STAR NO. 15(SIRIUS)
	RECOMMENDED NAV STARS NO. 16(PROCYON) NO. 22(REGULUS) NO. 24(SPICA)	(44+55) PROCEDURES FOR GNC ALIGN TO IMU (ADDENDUM 3)
(34+50)	PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5)	(45+00) PROCEDURES FOR STAR/LUNAR HORIZON SIGHTINGS - 5 SETS OF 3 MARKS EACH (ADDENDUM 4) (P23)
(34+55)	LMP RECEIVE BLOCK DATA PAN FROM GND	RECOMMENDED NAV STARS NO. 33(ANTARES) (NEAR HOR) NO. 33(ANTARES) (NEAR HOR) NO. 37(NUNKI) (NEAR HOR) NO. 45(FOMALHAUT) (FAR HOR) NO. 42(PEACOCK) (FAP HOR)
(35+00)	PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)	
(44+00)	LMP RECEIVE BLOCK DATA PAN FROM GND	(45+50) PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5) (P21)
(44+35)		

(46+00) PROCEDURES FOR GND UPLINK OF -SM  
STATE VECTOR AND P30 TARGET LOAD  
(ADDENDUM 8) (P27)

FOLLOWING GND UPLINK

P00 LEH WHEN COMP LT-OUT(NO INTEG)  
KEY V96E

F 16 54 (R,RDOT,THETA)  
COPY R AND RDOT  
PRO

F 04 05 (TRACK AXIS OPTION)  
LOAD 00002 IN R2  
PRO

F 06 18 (COMPUTED R,P,Y)  
COPY R,P,Y  
KEY V34E

P00 KEY V37E00E

KEY V47E (TRANSFER CSM SV  
FROM LM SLOTS TO CSM SLOTS)

(46+30) PROCEDURES FOR EXT DV TARGETING  
(ADDENDUM 9) (P30)

\*\*\*\*\*  
PROPULSION SYSTEM SELECTION  
USE RCS FOR DV GREATER THAN  
1FPS AND LESS THAN OR EQUAL  
TO 5FPS (A DV GREATER THAN

SPS REQUIRES SCHEDULING THE  
MIDCOURSE AT THE EARLIEST  
POSSIBLE TIME,HENCE THE SPS  
SHOULD NOT BE REQUIRED FOR  
THIS MIDCOURSE CORRECTION)

\*\*\*\*\*  
TRIM OVS TO ZERO  
\*\*\*\*\*

(46+35) PROCEDURES FOR SM RCS PROPULSION  
MONITOR CHECK  
(ADDENDUM 10)

(46+40) PROCEDURES FOR RCS THRUST SETUP  
(ADDENDUM 12) (P41)

(47+00) THIRD TRANSLUNAR MIDCOURSE

(47+05) PROCEDURES FOR SM RCS AND SPS  
PROPULSION MONITOR CHECKS  
(ADDENDUM 10)

(47+25) PROCEDURES FOR STAR/EARTH  
HORIZON SIGHTINGS - 3 SETS  
OF 3 MARKS EACH  
(ADDENDUM 4) (P23)

RECOMMENDED NAV STARS  
NO. 16 (PROCYON) (FAR HOR)  
NO. 22 (REGULUS) (FAR HOR)  
NO. 26 (SPICA) (NEAR HOR)

(47+55)	PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5)	(P21)	OF 3 MARKS EACH (ADDENDUM 4)	(P23)
(48+00)	PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)		RECOMMENDED NAV STARS NO. 37(NUNKI) (NEAR HOR) NO. 37(NUNKI) (NEAR HOR) NO. 33(ANTARES) (NEAR HOR) NO. 33(ANTARES) (NEAR HOR) NO. 33(ANTARES) (NEAR HOR)	
(51+00)	LMP RECEIVE BLOCK DATA PAD FROM GND		PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5)	(P21)
(52+05)	PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)	(51+25)	PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)	
(52+10)	PROCEDURES FOR IMU REALIGN TO REFSMMAT (ADDENDUM 2)	(50+25)	PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)	
	BACKUP ALIGN NAV STARS NO. 14(CANOPUS) NO. 12(RIGEL) BACKUP ALIGN CHECK NAV STAR NO. 15(SIRIUS)	(50+30)	PROCEDURES FOR GND UPLINK OF CSM STATE VECTOR,P30 TARGET LOAD,AND PREFEREC LUNAR ORBIT REFSMMAT (ADDENDUM 8)	(P27)
(52+25)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)		LMP RECEIVE GND BLOCK DATA PAD	
(52+30)	PROCEDURES FOR STAR/LUNAR HORIZON SIGHTINGS - 5 SETS	(60+00)	PROCEDURES FOR IMU ALIGN TO UPLINKED PREFERED REFSMMAT (ADDENDUM 2)	(P52)

BACKUP ALIGN NAV STARS  
NO. 14(CANOPUS)  
NO. 12(RIGEL)  
BACKUP ALIGN CHECK NAV STARS  
NO. 15(SIRIUS)

(60+25)

PROCEDURES FOR GDC ALIGN TO IMU  
(ADDENDUM 3)

(60+30)

PROCEDURES FOR EXT DV TARGETING  
(ADDENDUM 9)

\*\*\*\*\*  
PROPULSION SYSTEM SELECTION  
USE RCS FOR DV LESS THAN OR  
EQUAL TO SFPS (ANY GREATER  
THAN SFPS WILL BE SCHEDULED  
AT THE EARLIEST POSSIBLE TIME  
AND HENCE THIS MICCOURSE  
SHOULD NOT REQUIRE THE SPS)

\*\*\*\*\*  
TRIM DVS TO ZERO  
\*\*\*\*\*

(60+35)

PROCEDURES FOR SM RCS PROPULSION  
MONITOR CHECK  
(ADDENDUM 10)

(60+40)

PROCEDURES FOR RCS THRUST SETUP  
(ADDENDUM 12)

(61+00)

P00

FOURTH TRANSLUNAR MICCOURSE

(61+05)

PROCEDURES FOR SM RCS AND SPS  
PROPULSION MONITOR CHECKS  
(ADDENDUM 10)

(61+10)

PROCEDURES FOR LOI1 POSITION  
DETERMINATION  
(ADDENDUM 5)

(P21)

(61+15)

PROCEDURES FOR ESTABLISHING PTC  
(ADDENDUM 13)

(65+55)

PROCEDURES FOR TERMINATING PTC  
(ADDENDUM 14)

(66+00)

PROCEDURES FOR IMU REALIGN  
TO REF5MAT  
(ADDENDUM 2)  
BACKUP ALIGN NAV STARS  
NO. 14(CANOPUS)  
NO. 12(RIGEL)  
BACKUP ALIGN CHECK NAV STAR  
NO. 15(SIRIUS)

(P52)

(66+15)

PROCEDURES FOR GDC ALIGN TO IMU  
(ADDENDUM 3)

(66+20)

LMP RECEIVE LOI1 PAD FROM GND



FOR STAR CHECK  
(ROLL GMBL WILL RE THAT  
WHICH PROVIDES COMM)

CDR FUA1 SCALE-5/1  
FDAI SELECT-1/2  
MAN ATT(3)-RATE CMD  
LIMIT CYCLE-OFF  
ATT DB-MAX  
RATE-LOW  
SC CONT-CMC  
CMC MODE-AUTO  
RMAG MODE(3)-RATE2  
RHC-ARMED

LEB KEY V49E  
F 06 22 (FINAL GMBL ANGLES)  
LOAD BUJRN ATT STAR  
CHECK GMBL ANGLES  
KEY V62E

PRO  
F 50 18 (COMMANDED R.P.Y)

PRO  
06 18 (COMMANDED R.P.Y)  
CDR MONITOR ATT MANEUVER  
FOR GMBL LOCK

F 50 18 (COMMANDED R.P.Y)  
VERIFY R.P.Y AGREE WITH  
PAD R.P.Y WITHIN 5 DEG  
NULL FDAI NEEDLES WITH RH  
LEB PRO

G/N PWR-OPTICS-ON  
OPT ZERO-ZERO(15SEC)  
OPT TELTRUN-SLAVE TO SXT  
RETICLE BRT TW-ADJUST

OPT ZERO-OFF  
OPT MODE-CMC  
KEY V41NG1E  
F 21 92 (BLANK,BLANK,BLANK)  
LOAD PAD SHAFT ANGLE(XXX.XX)  
IN R1 AND PAD TRUNNION ANGLE  
(XX.XXX) IN R2  
41 88 (SHAFT,TRUNNION,BLANK)  
MONITOR OPT DRIVE TO PAD  
VALUES  
VERIFY PAD STAR IN SXT  
OPT MODE-MAN  
DRIVE TRUN LESS THAN 5 DEG  
OPT ZERO-ZERO  
RETICLE BRT TW-MIN ARTNESS

(66+30) PROCEDURES FOR ESTABLISHING PTC  
(ADDENDUM 13)

(67+30) PROCEDURES FOR TERMINATING PTC  
(ADDENDUM 14)

(67+35) PROCEDURES FOR GDC DRIFT CHECK  
(ADDENDUM 7)

(67+40) PROCEDURES FOR IMU REALIGN TO  
REFSMAT FOR DRIFT CHECK  
(ADDENDUM 2) (P52)

HACKUP ALIGN NAV STARS  
NO. 14 (CANOPUS)  
NO. 12 (RIGEL)

(67+55)	RACKUP ALIGN CHECK NAV ST.R NO. 15(SIRIUS)	PROCEDURES FOR SPS THRUST SETUP (ADDENDUM 11)
(68+00)	MSFN LOS (68+57) (69+07)	FIRST LUNAR ORBIT INJECTION
	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)	
	CDR RECEIVE GO/NO-GO FOR LOI	
	PROCEDURES FOR GND UPLINK OF SM STATE VECTOR AND P30 TARGET LOAD (ADDENDUM 8)	*** BEGIN REV 1 *** (69+09)
	LMP INITIATE PRE-LOI SYSTEMS CHECK	
(68+20)	PROCEDURES FOR LOI POSITION DETERMINATION (ADDENDUM 5)	LMP TLM INPUTS PCM-LAR TAPE RCDR-FWD (69+20)
(68+25)	PROCEDURES FOR EXT DV TARGETING (ADDENDUM 9)	PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECKS (ADDENDUM 10)
	***** PROPULSION SYSTEM SELECTION USE SPS AND DO NOT TRIM DVS *****	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)
(68+30)	PROCEDURES FOR SM RCS PROPULSION MONITOR CHECKS (ADDENDUM 10)	PROCEDURES FOR ORDEAL SETUP (ADDENDUM 18)
(68+35)		CDR ATT DR-MAX RATE-LOW BMAG MODE(3)-ATT1/RATE2 SC CONT-SCS MAN ATT(R)-ACC CMD

MAN ATT(P,Y)-RATE CMD  
MANEUVER SC IN ROLL 180 DEG  
MAN ATT(3)-RATE CMD

LMP SELECT S BD ANT OMNI-A OR B  
OVRU-ON  
SH HANGING-OFF

MSFN AOS  
(69+30)

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

LMP RECEIVE BLOCK DATA FOR  
TEI FROM MSFN

SUNDOWN  
(70+14)

PROCEDURES FOR IMU REALIGN  
TO REFSMMAT  
(ADDENDUM 2) (P52)

RACKUP ALIGN NAV STARS  
NO. 14(CANOPUS)  
NO. 17(RIGEL)  
RACKUP ALIGN CHECK NAV STAR  
NO. 15(SIRIUS)

(70+30)

PROCEDURES FOR GDC ALIGN TO I-U  
(ADDENDUM 3)

PROCEDURES FOR ORDEAL

VERIFICATION  
(ADDENDUM 18)

LMP UP TLM-CMD RESET  
UP TLM-NORMAL

MSFN LOS  
(70+55)

CDR MAN ATT(P)-ACC CMD  
MANEUVER SC TO 315 DEG PITCH  
AND 180 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE

SUNUP  
(71+00)

(71+05)

CMP CONTROL POINT LMK  
FAMILIARIZATION  
IDENTIFY IDENTIFICATION POINTS  
AND CONTROL POINTS AT  
RESPECTIVE TIMES OF CLOSEST  
APPROACH

\*\*\* REGIN REV 2 \*\*\*  
(71+21)

(71+30)

\*\*\*PREPARE FOR TV PICTURES\*\*

CDR MAN ATT(Y)-ACCEL CMD  
YAW SC RIGHT TO 45 DEG YAW  
315 DEG PITCH AND 180 DEG  
ROLL W.R.T. LOCAL HORIZONTAL  
MAN ATT(Y)-RATE CMD  
MAINTAIN ORBITAL PITCH RATE  
FOR TV PICTURES

LMP SELECT S HD ANT OMNI-4 OR B  
NVBU-ON  
SR RANGING-OFF

MSFN AOS  
(71+38)

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

(71+40) PROCEDURES FOR GND UPLINK OF FSN  
STATE VECTOR AND P30 TARGET LOAD  
(ADDENDUM 8)

(71+50) CDR MAN ATT(Y)-ACCEL CMD  
YAW SC LEFT TO 0 DEG YAW  
315 DEG PITCH AND 180 DEG  
ROLL W.R.T. LOCAL HORIZONTAL  
MAN ATT(Y)-RATE CMD  
MAINTAIN ORBITAL PITCH RATE

(72+00) CMP PSEUDO LANDING SITE  
FAMILIARIZATION  
IDENTIFY IDENTIFICATION POINTS

AND PSEUDO LANDING SITE AT  
RESPECTIVE TIMES OF CLOSEST  
APPROACH

CDR STOP PITCH RATE BY SWITCHING  
MAN ATT(3)-RATE CMD

(72+15)

CDR RECEIVE GO/NO-GO FOR LOI2

SUNDOWN  
(72+22)

LMP RECEIVE BLOCK DATA FOR  
TEI FROM MSFN

(72+30)

PROCEDURES FOR IMU REALIGN  
TO REFSMMAT  
(ADDENDUM 2) (P52)

BACKUP ALIGN NAV STARS  
NO. 14(CANOPUS)  
NO. 12(RIGEL)  
BACKUP ALIGN CHECK NAV STAR  
NO. 15(SIRIUS)

(72+45)

PROCEDURES FOR GDC ALIGN TO IMU  
(ADDENDUM 3)

(72+50)

PROCEDURES FOR EXT DV TARGETING  
(ADDENDUM 9) (P30)

\*\*\*\*\*

PROPULSION SYSTEM SELECTION  
USE SPS/DO NOT TRIM DV  
\*\*\*\*\*

(72+55)

PROCEDURES FOR SM RCS PROPULSION  
MONITOR CHECK  
(ADDENDUM 10)

LMP UP TLM-CMU RESET  
UP TLM-NORMAL

MSFN LOS  
(73+03)

PROCEDURES FOR SPS THRUST SETUP  
(ADDENDUM 11)

SUNUP  
(73+09)

(73+31)

SECOND LUNAR ORBIT INJECTION

LMP TLM INPUTS PCM-LBR  
TAPE RCOR-FWD

\*\*\* BEGIN REV 3 \*\*\*  
(73+31)

(73+35)

PROCEDURES FOR SM RCS AND SPS  
PROPULSION MONITOR CHECKS

(ADDENDUM 10)

PROCEDURES FOR GDC ALIGN TO IMU  
(ADDENDUM 3)

(73+40)

PROCEDURES FOR ORDEAL SETUP  
(ADDENDUM 18)

(73+45)

CDR ATT DB-MAX  
RATE-LOW  
BMAG MODE(3)-ATT 1/RATE 2  
SC CONT-SCS  
MAN ATT(R,P)-ACCEL CMD  
MAN ATT(Y)-RATE CMD  
MANEUVER SC TO 307 DEG PITCH  
AND 190 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(R)-RATE CMD  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE  
  
LMP SELECT S BD ANT OMNI-A OR B  
OVBU-ON  
SB RANGING-OFF

MSFN AOS  
(73+47)

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

(74+15)

CDR WHEN PSEUDO LANDING SITE IS

ACQUIRED IN COAS-INCREASE  
THE PITCH RATE TO KEEP X-AXIS  
CAMERAS POINTED AT IT  
TERMINATE PITCH RATE WHEN  
LANDMARK IS NO LONGER VISIBLE  
CDR MAN ATT(P)-ACCEL CMD  
PITCH SC DOWN TO 0 DEG PITCH  
AND 180 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(P)-RATE CMD

SUNDOWN  
(74+22)

LMP RECEIVE BLOCK DATA FOR  
TEI FROM MSFN

(74+30)

PROCEDURES FOR IMU REALIGN  
TO REFSMMAT  
(ADDENDUM 2)

(P52)

BACKUP ALIGN NAV STARS  
NO 14(CANOPUS)  
NO 12(RIGEL)  
BACKUP ALIGN CHECK NAV STAR  
NO 15(SIRIUS)

(74+45)

PROCEDURES FOR GDC ALIGN TO IMU  
(ADDENDUM 3)

(74+50)

PROCEDURES FOR ORDEAL  
VERIFICATION  
(ADDENDUM 18)

(74+55)

LMP BEGIN PHOTOGRAPHIC PREPARATION  
FOR VERTICAL STEREO  
NAVIGATION PHOTOGRAPHY

LMP UP TLM-CMD RESET  
UP TLM-NORMAL

MSFN LOS  
(74+59)

CDR MAN ATT(P)-ACCEL CMD  
PITCH SC UP TO 270 DEG PITCH  
AND 180 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE

SUNUP  
(75+09)

(75+13)

LMP KEY V06N65

(75+15)

CDR LMP WHEN X-AXIS CROSSES TERMINATOR  
KEY ENTER/START CAMERA FOR  
VERTICAL STEREO NAVIGATION  
PHOTOGRAPHY

06 65 (GET)

LMP RECORD GET  
CDR KEY N20E

06 20 (K,P,Y)

LMP RECORD PRESENT GMBL ANGLES

LMP MONITOR PHOTOGRAPHY

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FINAL MISSION C-PRIME TRANSLUNAR LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE -12 NOV 1968

CDR MONITOR ORBITAL PITCH RATE

\*\*\* BEGIN REV 4 \*\*\*  
(75+30)

(75+40)

CDR MAN ATT(R)-ACCEL CMD  
AT THE SUBSOLAR POINT-  
ROLL SC 180 DEG TO 0 DEG ROLL  
AND 270 DEG PITCH W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(R)-RATE CMD  
REINITIATE ORBITAL PITCH RATE

LMP SELECT S BD ANT OMNI-C OR U  
NVRU-ON  
SR RANGING-OFF

MSFN AOS  
(75+46)

(75+55)

CDR KEY V06N65  
CDR,LMP KEY ENTER/STOP CAMERA  
06 65 (GET)  
LMP RECORD GET  
CDR KEY N20E  
06 20 (R,P,Y)  
LMP RECORD PRESENT GMRL ANGLES  
CDR STOP PITCH RATE

(76+00)-(TCA OF 70 DEG LONGITUDE WILL  
BE UPDATED REALTIME)

CDR MAN ATT(P)-A CEL CMD  
PITCH UP TO 5 DEG PITCH  
AND 0 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE  
LMP ENTER LER

(76+05)

\*\*\*BEGIN LANDING SITE LIGHTING  
EVALUATION\*\*

LER KEY V37E22E

P22

F 06 45 (BLANK,BLANK,MAX MGA)

LER PRO

F 05 70 (LANDMARK CODE)

LOAD 10001 IN R2

LER OPT ZERO-OFF

OPT MODE-MAN

POSITION TRUNNION TO 10 DEG  
LER IDENTIFY IDENTIFICATION POINTS  
AND PSEUDO LANDING SITE AT  
THEIR RESPECTIVE ACQUISITION  
TIMES

EVALIATE THE LIGHTING BETWEEN  
THE LANDING SITE AND THE  
TERMINATOR

LER UPON ACQUISITION OF THE

TERMINATOR-

OPT MODE-CMC

LER PRO

06 92 (SHAFT,TRUN,BLANK)

EVALIATE AUTO OPTICS ACQUI-  
TION OF THE PSEUDO LANDING

SITE  
 CDR ROLL TO AVOID SHAFT AXIS  
 WITHIN 10 DEG OF LANDING SITE  
 LEB WHEN LANDING SITE NO LONGER  
 VISIBLE-  
 OPT MODE-MAN  
 EVALUATE EARTHSHINE TRACKING  
 FEASIBILITY  
 LEB POSITION TRUNNION TO 5 DEG  
 OPT ZERO-ZERO  
 OPT MODE-MAN  
 LEB KEY V37E00E

P00

(76+20)

CDR MAN ATT(P)-RATE CMD  
 MAN ATT(R)-ACCEL CMD  
 ROLL SC 180 DEG TO ABOUT  
 0 DEG PITCH AND 180 DEG  
 ROLL W.R.T. LOCAL HORIZONTAL  
 MAN ATT(R)-RATE CMD

SUNDOWN  
 (76+21)

PROCEDURES FOR HI GAIN ACQUISITION  
 OF MSFN  
 (ADDENDUM 19)

(76+25)

PROCEDURES FOR GND UPLINK OF ASM  
 STATE VECTOR  
 (ADDENDUM 8)

CMP KEY V47E

LMP RECEIVE BLOCK DATA FOR  
 TEI FROM MSFN  
 (76+30)  
 PROCEDURES FOR IMU REALIGN  
 TO REFSMMAT  
 (ADDENDUM 2) (P52)  
 BACKUP ALIGN NAV STARS  
 NO 14(CANOPUS)  
 NO 12(RIGEL)  
 BACKUP ALIGN CHECK NAV STAR  
 NO 15(SIRIUS)

(76+45)

PROCEDURES FOR GNC ALIGN TO IMU  
 (ADDENDUM 3)

(76+50)

PROCEDURES FOR ORDEAL VERIFICATION  
 (ADDENDUM 18)

LMP UP TLM-CMD RESET  
 UP TLM-NORMAL

MSFN LOS  
 (76+58)

CDR MAN ATT(R,P)-ACCEL CMD  
 MANEUVER SC TO 5 DEG PITCH  
 AND 0 DEG ROLL W.R.T.  
 LOCAL HORIZONTAL  
 MAN ATT(R)-RATE CMD  
 MAN ATT(P)-MIN IMP  
 INITIATE ORBITAL PITCH RATE  
 FOR LANDMARK SIGHTINGS



SUNUP (77+07)		
(77+25)	PROCEDURES FOR TRACKING THE SECOND CONTROL POINT LANDMARK (NO AUTO OPTICS) (ADDENDUM 16)	(P22)
*** BFGIN REV 5 *** (77+29)		
	LMP SELECT S RD ANT OMNI-C OR D DVRU-ON SR RANGING-OFF	
MSFN AOS (77+44)		
(78+05)	PROCEDURES FOR TRACKING THE PSEUDO LANDING SITE (ADDENDUM 15)	(P22)
(78+15)	CNR MAN ATT(R)-ACCFL CMD ROLL SC 180 DEG TO ABOUT 300 DFG PITCH AND 180 DEG ROLL W.R.T. LOCAL HORIZO. TAI MAN ATT(R,P)-RATE CMD	
(78+20)		
	SUNDOWN	
	PROCEDURES FOR HI GAIN ACQUISITION OF MSFN (ADDENDUM 19)	
(78+25)	PROCEDURES FOR GND UPLINK OF CSM STATE VFCTOR (ADDENDUM 8)	
	CMP KEY V47E	
	LMP RECEIVE BLOCK DATA FOR TFI FROM MSFN	
(78+30)	PROCEDURES FOR IMU REALIGN TO REFSMAT (ADDENDUM 12)	(P52)
	HACKUP ALIGN NAV STARS NO 14(CANOPUS) NO 12(RIGEL) HACKUP ALIGN CHECK NAV STAR NO 15(SIRIUS)	
(78+45)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)	
(78+50)	PROCEDURES FOR ORDEAL VERIFICATION (ADDENDUM 18)	
	LMP UP TLM-CMD RESET	

UP TLM-NORMAL

MSFN LOS  
(79+55)

(80+00)

PROCEDURES FOR TRACKING THE  
PSEUDO LANDING SITE  
(ADDENDUM 15) (P22)

CDR MAN ATT(R,P)-ACCEL CMD  
MANEUVER SC TO 5 DEG PITCH  
AND 0 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(R)-RATE CMD  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE  
FOR LANDMARK SIGHTINGS

(80+15)

CDR MAN ATT(R)-ACCEL CMD  
ROLL SC 180 DEG TO ABOUT  
300 DEG PITCH AND 180 DEG  
ROLL W.R.T. LOCAL HORIZONTAL  
MAN ATT(R,P)-RATE CMD

SUNUP  
(80+18)

SUNUP  
(79+06)

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

(79+25)

PROCEDURES FOR TRACKING THE  
SECOND CONTROL POINT LANDMARK  
(WITH AUTO OPTICS)  
(ADDENDUM 17) (P22)

(80+25)

PROCEDURES FOR GND UPLINK OF CSM  
STATE VECTOR  
(ADDENDUM 8)

\*\*\* BEGIN REV 6 \*\*\*  
(79+28)

CMR KEY V47E

LMP RECEIVE BLOCK DATA FOR  
TEI FROM MSFN

LMP SELECT S BD ANT OMNI-C OR D  
DVBU-ON  
SB RANGING-OFF

(80+30)

PROCEDURES FOR IMU REALIGN  
TO REFSMAT  
(ADDENDUM 12) (P52)

MSFN AOS  
(79+42)

BACKUP ALIGN NAV STARS  
NO 14(CANOPUS)

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FINAL MISSION C-PRIME TRANS-LUNAR LUNAR PARKING ORBIT AND TRANSEARTH TIMELINE - 12 NOV 1968

NO 12 (RIGEL)  
 BACKUP ALIGN CHECK NAV STAR  
 NO 15 (SIRIUS)  
 (80+45) PROCEDURES FOR GDC ALIGN TO I-U  
 (ADDENDUM 3)  
 (80+50) PROCEDURES FOR ORDEAL VERIFICATION  
 (ADDENDUM 18)  
 LMP UP TLM-CMU RESET  
 I/P TLM-NORMAL  
 MSFN LOS  
 (80+54)  
 CDR MAN ATT(R,P)-ACCEL CMD  
 MANEUVER SC TO 5 DEG PITCH  
 AND 0 DEG ROLL W.R.T.  
 LOCAL HORIZONTAL  
 MAN ATT(R)-RATE CMD  
 MAN ATT(P)-MIN IMP  
 INITIATE ORBITAL PITCH RATE  
 FOR LANDMARK SIGHTINGS  
 SUNUP  
 (81+04)  
 (81+10) PROCEDURES FOR TRACKING THE  
 FIRST CONTROL POINT LANDMARK  
 (NO AUTO OPTICS)  
 (ADDENDUM 16)  
 (P22)  
 (81+25) PROCEDURES FOR TRACKING THE  
 SECOND CONTROL POINT LANDMARK  
 (WITH AUTO OPTICS)  
 (ADDENDUM 17)  
 (P22)  
 \*\*\* BEGIN REV 7 \*\*\*  
 (81+27)  
 LMP SELECT S BD ANT OMNI-C OR D  
 DVBU-ON  
 SB RANGING-OFF  
 MSFN AOS  
 (81+40)  
 PROCEDURES FOR TRACKING THE  
 THIRD CONTROL POINT LANDMARK  
 (NO AUTO OPTICS)  
 (ADDENDUM 16)  
 (P22)  
 (82+00) PROCEDURES FOR TRACKING THE  
 PSEUDO LANDING SITE  
 (ADDENDUM 15)  
 (P22)  
 (82+15) CDR MAN ATT(R)-ACCEL CMD  
 ROLL SC 180 DEG TO ABOUT  
 300 DEG PITCH AND 180 DEG  
 ROLL W.R.T. LOCAL HORIZONTAL  
 MAN ATT(R,P)-RATE CMD  
 (P22)

SUNDOWN  
(82+17)

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

( 2+25)

PROCEDURES FOR GND UPLINK OF ASM  
STATF VECTOR  
(ADDENDUM 8)

CMP KEY V47E

LMP RECEIVF RLOCK DATA FOR  
TEI FROM MSFN

(82+30)

PROCEDURES FOR IMU REALIGN  
TO REFMMAT  
(ADDENDUM 12) (P55)

BACKUP ALIGN NAV STARS  
NO 14(CANOPUS)  
NO 12(RIGEL)  
BACKUP ALIGN CHECK NAV STAR  
NO 15(SIRIUS)

(82+45)

PROCEDURES FOR GDC ALIGN TO I.U  
(ADDENDUM 3)

(82+50)

PROCEDURES FOR ORDEAL VERIFICATION  
(ADDENDUM 18)

LMP UP TLM-CMD RESET  
UP TLM-NORMAL

MSFN LOS  
(82+52)

CDR MAN ATT(R,P)-ACCEL CMD  
MANEUVER SC TO 5 DEG PITCH  
AND 0 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(R)-RATE CMD  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE  
FOR LANDMARK SIGHTINGS

SUNUP  
(83+03)

PROCEDURES FOR TRACKING THE  
FIRST CONTROL POINT LANDMARK  
(WITH AUTO OPTICS)  
(ADDENDUM 17) (P22)

(83+20)

PROCEDURES FOR TRACKING THE  
SECOND CONTROL POINT LANDMARK  
(WITH AUTO OPTICS)  
(ADDENDUM 17) (P22)

\*\*\* BEGIN REV 8 \*\*\*  
(83+26)

LMP SELECT S BD ANY OMNI-C OR D

OVRU=ON  
SR RANGING-OFF

MSFN AOS  
(83+39)

PROCEDURES FOR TRACKING THE  
THIRD CONTROL POINT LANDMARK  
(WITH AUTO OPTICS)  
(ADDENDUM 17) (P22)

(84+00) PROCEDURES FOR TRACKING THE  
PSEUDO LANDING SITE  
(ADDENDUM 15) (P22)

(84+10) CDR MAN ATT(R)-ACCFL CMD  
ROLL SC 180 DEG TO ABOUT  
300 DEG PITCH AND 180 DEG  
ROLL W.R.T. LOCAL HORIZONTAL  
MAN ATT(R,P)-RATE CMD

(84+15)  
SUNDOWN

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

(84+20) PROCEDURES FOR GND UPLINK OF MSN  
STATE VECTOR  
(ADDENDUM 8)

CMP KEY V47E

LMP RECEIVE BLOCK DATA FOR  
TEI FROM MSFN

(84+25) PROCEDURES FOR IMU REALIGN  
TO REFSMMAT  
(ADDENDUM 12) (P52)

BACKUP ALIGN NAV STARS  
NO 14(CANOPUS)  
NO 12(RIGEL)  
BACKUP ALIGN CHECK NAV STAR  
NO 15(SIRIUS)

(84+40) PROCEDURES FOR GDC ALIGN TO IMU  
(ADDENDUM 3)

PROCEDURES FOR ORDEAL VERIFICATION  
(ADDENDUM 18)

LMP BEGIN PHOTOGRAPHIC PREPARATION  
FOR DARKSIDE AND SOLAR CORONA  
PHOTOGRAPHY

CDR MAN ATT(P)-ACCEL CMD  
PITCH SC UP TO 0 DEG PITCH  
AND 180 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE

(84+45) LMP PERFORM DARKSIDE AND SOLAR  
CORONA PHOTOGRAPHY

LMP UP TLM-CMD RESET  
UP TLM-NORMAL

MSFN LOS  
(84+51)

(85+00)

LMP BEGIN PHOTOGRAPHIC PREPARATION  
FOR CONVERGENT STEREO  
NAVIGATION PHOTOGRAPHY

CDR MAN ATT(P)-ACCEL CMD  
PITCH SC UP TO 290 DEG PITCH  
AND 180 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE

SUNUP  
(85+02)

(85+05)

LMP KEY V06N65

CDR LMP WHEN X-AXIS CROSSES TERMINATOR  
KEY ENTER/START CAMERA FOR  
CONVERGENT STEREO NAVIGATION  
PHOTOGRAPHY

06 65 (GET)

LMP RECORD GET

CDR KEY N20E

06 20 (R,P,Y)

LMP RECORD PRESENT GMRL ANGLES

LMP MONITOR PHOTOGRAPHY

CDR MONITOR ORBITAL PITCH RATE

\*\*\* BEGIN REV 9 \*\*\*  
(85+25)

(85+35)

CDR MAN ATT(P)-ACCEL CMD  
PITCH SC UP 40 DEG TO 250 DEG  
PITCH AND 180 DEG ROLL W.R.T.  
LOCAL HORIZONTAL AT THE  
SUBSOLAR POINT

MAN ATT(P)-MIN IMP  
REINITIATE ORBITAL PITCH RATE  
(ROLL AS REQUIRED TO SHADE  
WINDOWS)

LMP SELECT S BD ANT OMNI-C OR D  
DVBU-ON  
SB RANGING-OFF

MSFN AOS  
(85+37)

(85+10)

CDR KEY V06N65  
CDR LMP KEY ENTER/STOP CAMERA

06 65 (GET)

LMP RECORD GET

CDR KEY N20E

06 20 (R,P,Y)

LMP RECORD PRESENT GMRL ANGLES

CDR STOP PITCH RATE

SUNDOWN

FINAL MISSION C-PRIME TRANSLUNAR, LUNAR PARKING ORBIT, AND TRANSEARTH TIMELINE -12 NOV 1968

(86+14)

CDR MAN ATT(P)-ACCEL CMD  
PITCH SC DOWN 60 DEG TO ABOUT  
310 DEG PITCH AND 180 DEG  
ROLL W.R.T. LOCAL HORIZONTAL  
(ROLL 180 DEG IF REQUIRED)  
MAN ATT(R,P)-RATE CMD

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

(86+20)

PROCEDURES FOR GND (LINK OF PSM  
STATE VECTOR  
(ADDENDUM 8)

CMP KEY V47E

LMP RECEIVE BLOCK DATA FOR  
TEI FROM MSFN

(86+25)

PROCEDURES FOR IMU REALIGN  
TO REFSMMAT  
(ADDENDUM 12) (P52)

BACKUP ALIGN NAV STARS  
NO 14(CANOPUS)  
NO 12(RIGEL)  
BACKUP ALIGN CHECK NAV STAR  
NO 15(SIRIUS)

(86+40)

PROCEDURES FOR GDC ALIGN TO I.U

(ADDENDUM 3)

PROCEDURES FOR IDEAL VERIFICATION  
(ADDENDUM 1)

LMP UP TLM-CMD) RESET  
UP TLM-NORMAL

MSFN LOS  
(86+49)

CDR MAN ATT(P)-ACCEL CMD  
PITCH SC UP TO 270 DEG PITCH  
AND 180 DEG ROLL W.R.T.  
LOCAL HORIZONTAL  
MAN ATT(P)-MIN IMP  
INITIATE ORBITAL PITCH RATE  
FOR LUNAR OBSERVATION

SUNUP  
(87+00)

\*\*\* BEGIN REV 10 \*\*\*  
(87+24)

LMP SELECT S BD ANT OMNI-A OR B  
DVRU-ON  
SB RANGING-OFF

MSFN AOS  
(87+35)

CDR MAN ATT(P)-RATE CMD

PROCEDURES FOR HI GAIN ACQUISITION  
OF MSFN  
(ADDENDUM 19)

(87+40)

PROCEDURES FOR GND UPLINK OF -SM  
STATE VECTOR AND P30 TARGET ,OAN  
(ADDENDUM 8)

LMP RECEIVE BLOCK DATA FOR  
TEI FROM MSFN

(87+55)

PROCEDURES FOR TEI BURN ATT  
CHECK EXCEPT ROLL

CDR FDAI SCALE-5/1  
FDAI SELECT-1/2  
MAN ATT(3)-RATE CMD  
LIMIT CYCLE-OFF  
ATT DB-MAX  
RATE-LOW  
SC CONT-CMC  
CMC MODE-AUTO  
RMAG MODE(3)-RATE2  
RMC-ARMED

LEB KEY V49E

F 06 22 (FINAL GMBL ANGLES)  
LOAD BURN ATT STAR  
CHECK GMBL ANGLES  
KEY V62E

PRO  
F 50 18 (COMMANDED R,P,Y)  
PRO

06 18 (COMMANDED R,P,Y)  
CDR MONITOR ATT MANEUVER  
FOR GMBL LOCK  
F 50 18 (COMMANDED R,P,Y)  
VERIFY R,P,Y AGREE WITH  
PAD R,P,Y WITHIN 5 DEG  
NULL FDAI NEEDLES WITH RMC  
LEB PRO

G/N PWR,OPTICS-ON  
OPT ZERO-ZERO(15SEC)  
OPT TELTRUN-SLAVE TO SXT  
RETICLE BRT TW-ADJUST  
OPT ZERO-OFF  
OPT MODE-CMC  
KEY V41N91E  
F 21 92 (BLANK,BLANK,BLANK)  
LOAD PAD SHAFT ANGLE(+XXX.XX)  
IN R1 AND PAD TRUNNION ANGLE  
(+XX.XXX) IN R2

41 88 (SHAFT,TRUNNION,BLANK)  
MONITOR OPT DRIVE TO PAD  
VALUES

VERIFY PAD STAR IN SXT  
OPT MODE-MAN  
DRIVE TRUN LESS THAN 5 DEG  
OPT ZERO-ZERO  
RETICLE BRT TW-MIN BRTNESS

(8A+05) PROCEDURES FOR GDC DRIFT CHECK  
(ADDENDUM 7)

(8A+10) CDR RECEIVE GO/NO-GO FOR TEI



(88+13)	SUNDOWN	LMP INITIATE PRE-TEI SYSTEMS CHECK	MSFN LOS (8A+48)
(88+15)		PROCEDURES FOR IMU REALIGN TO REFSMMAT FOR DRIFT CHECK (ADDENDUM 2) (P52)	(8A+45) PROCEDURES FOR SPS THRUST SETUP (ADDENDUM 11) (P40)
		BACKUP ALIGN NAV STARS NO. 14 (CANOPUS) NO. 12 (RIGEL) BACKUP ALIGN CHECK NAV STARS NO. 15 (SIRIUS)	SUNUP (8A+59)
(88+30)		PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)	(89+15) TRANSEARTH INJECTION
(88+35)		PROCEDURES FOR EXT DV TARGETING (ADDENDUM 9) (P30)	(89+20) PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECKS (ADDENDUM 10)
		***** PROPULSION SYSTEM SELECTION USE SPS AND TRIM DVS TO 2 FPS *****	P00 CDR MAN ATT(P)-ACC CMD RMC-ARMED MANEUVER SC IN PITCH(UP) TO MONITOR MOON IN CMD WINDOW MAN ATT(3)-RATE CMD
(88+40)		PROCEDURES FOR SM RCS PROPULSION MONITOR CHECK (ADDENDUM 10)	MSFN AOS (8C+20)
		LMP UP TLM CMU-RESET THEN NOR..	PROCEDURES FOR HIGH GAIN ANT ACQUISITION (ADDENDUM 19)
			(90+00) PROCEDURES FOR IMU REALIGN TO REFSMMAT (ADDENDUM 2) (P52)

(90+15)	BACKUP ALIGN NAV STARS NO. 14(CANOPIUS) NO. 12(RIGEL) BACKUP ALIGN CHECK NAV STAR NO. 15(SIRIUS)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)	PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)
(90+30)	PROCEDURES FOR STAR/LUNAR HORIZON SIGHTINGS - 8 SETS OF 3 MARKS EACH (ADDENDUM 4)	(P23)	PROCEDURES FOR IMU REALIGN TO REFMMAT (ADDENDUM 2) (P52)
	RECOMMENDED NAV STARS NO. 1(ALPHERATZ)(NEAR HOR) NO. 1(ALPHERATZ)(NEAR HOR) NO. 10(MIRFAK)(FAR HOR) NO. 10(MIRFAK)(FAR HOR) NO. 11(ALDEBARAN)(FAR HOR) NO. 11(ALDEBARAN)(FAR HOR) NO. 2(DIPHDA)(NEAR HOR) NO. 2(DIPHDA)(NEAR HOR)	(10n+25)	BACKUP ALIGN NAV STARS NO. 14(CANOPIUS) NO. 12(RIGEL) BACKUP ALIGN CHECK NAV STAR NO. 15(SIRIUS)
(91+50)	PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)	(10n+30)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)
(91+55)	PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6)		PROCEDURES FOR STAR/LUNAR HORIZON SIGHTINGS - 3 SETS OF 3 MARKS EACH (ADDENDUM 4) (P23)
(100+05)		(101+20)	RECOMMENDED NAV STARS NO. 1(ALPHERATZ)(NEAR HOR) NO. 11(ALDEBARAN)(FAR HOR) NO. 2(DIPHDA)(NEAR HOR)
			PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 6 SETS OF 3 MARKS EACH (ADDENDUM 4) (P23)
			RECOMMENDED NAV STARS

<p>NO. 22(REGULUS) (FAR HOR)          NO. 22(REGULUS) (FAR HOR)          NO. 26(SPICA) (NEAR HOR)          NO. 26(SPICA) (NEAR HOR)          NO. 31(ARCTURUS) (NEAR HOR)          NO. 31(ARCTURUS) (NEAR HOR)</p>	<p>(103+10)</p>	<p>KEY V47E (TRANSFER CSM SV          FROM LM SLOTS TO CSM SLOTS)</p>
<p>PROCEDURES FOR RETURN TO          EARTH TARGETING          (ADDENDUM 6)</p>	<p>(102+20)</p>	<p>PROCEDURES FOR IMU ALIGN TO          UPLINKED PREFERRED REFSMMAT          (ADDENDUM 2) (P52)</p>
<p>PROCEDURES FOR GND UPLINK OF CSM          STATE VECTOR, P30 TARGET LOAD, AND          PREFERRED ENTRY REFSMMAT          (ADDENDUM 9)</p>	<p>(102+50)</p>	<p>BACKUP ALIGN NAV STARS          NO. 14(CANOPUS)          NO. 12(RIGEL)          BACKUP ALIGN CHECK NAV STAR          NO. 15(SIRIUS)</p>
<p>FOLLOWING GND UPLINK          LEB WHEN COMP LT-OUT(NO INTEG)          KEY V96E          KEY V83E          F 16 54 (R,ROOT,THETA)          COPY R AND ROOT          PRO          KEY V89E          F 04 06 (TRACK AXIS OPTION)          LOAD 00002 IN R2          PRO          F 06 18 (COMPUTED R,P,Y)          COPY R,P,Y          KEY V34E          KEY V37E00E</p>	<p>(103+25)          (103+30)</p>	<p>PROCEDURES FOR GDC ALIGN TO IMU          (ADDENDUM 9)          PROCEDURES FOR EXT DV TARGETING          (P30)          *****          PROPLSION SYSTEM SELECTION          USE RCS FOR DV LESS THAN OR          EQUAL TO 12FPS          USE SPS FOR DV GREATER          THAN 12FPS          TRIM DVS TO ZERO          *****          PROCEDURES FOR SM RCS PROPLSION          MONITOR CHECK          (ADDENDUM 10)</p>

(103+40)	PROCEDURES FOR RCS THRUST SET-UP (ADDENDUM 12)	(P41)	
(104+00)	FIRST TRANSEARTH MIDCOURSE		
(104+05)	PROCEDURES FOR SM RCS AND SPS PROPULSION MONITOR CHECKS (ADDENDUM 10)		
(105+15)	PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 5 SETS OF 3 MARKS EACH (ADDENDUM 4)	(P21)	
	RECOMMENDED NAV STARS		
	NO. 22 (REGULUS) (FAR HOR)		
	NO. 22 (REGULUS) (FAR HOR)		
	NO. 26 (SPICA) (NEAR HOR)		
	NO. 31 (ARCTURIUS) (NEAR HOR)		
	NO. 31 (ARCTURIUS) (NEAR HOR)		
(106+15)	PROCEDURES FOR STAR/LUNAR HORIZON SIGHTINGS - 3 SETS OF 3 MARKS EACH (ADDENDUM 4)	(P23)	
	RECOMMENDED NAV STARS		
	NO. 22 (REGULUS) (FAR HOR)		
	NO. 22 (REGULUS) (FAR HOR)		
	NO. 26 (SPICA) (NEAR HOR)		
	NO. 31 (ARCTURIUS) (NEAR HOR)		
	NO. 31 (ARCTURIUS) (NEAR HOR)		
(106+45)	PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6)	(P37)	
(107+40)	PROCEDURES FOR IMU REALIGN TO REFSMMAT (ADDENDUM 2)	(P52)	
	BACKUP ALIGN NAV STARS		
	NO. 14 (CANOPUS)		
	NO. 12 (RIGEL)		
	BACKUP ALIGN CHECK NAV STAR		
	NO. 15 (SIRIUS)		
(107+55)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)		
(108+00)	PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 5 SETS OF 3 MARKS EACH (ADDENDUM 4)	(P23)	
	RECOMMENDED NAV STARS		
	NO. 22 (REGULUS) (FAR HOR)		
	NO. 22 (REGULUS) (FAR HOR)		
	NO. 26 (SPICA) (NEAR HOR)		
	NO. 31 (ARCTURIUS) (NEAR HOR)		
	NO. 31 (ARCTURIUS) (NEAR HOR)		
(108+50)	PROCEDURES FOR ESTABLISHING PTC (ADDENDUM 13)		

(108+55)	PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6)	(P37)	(120+30)	PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6)	(P37)
(119+35)	PROCEDURES FOR TERMINATING PTC (ADDENDUM 14)		(121+00)	PROCEDURES FOR GND UPLINK OF CSM STATE VECTOR AND P30 TARGET LOAD (ADDENDUM 8)	
(119+40)	PROCEDURES FOR IMU REALIGN TO REFMMAT (ADDENDUM 2)	(P52)	P00	LEB WHEN COMP LT-OUT(NO INTEG) KEY V96E KEY V83E F 16 54 (R,RDOT,THETA) COPY R AND RDOT PRO KEY V89E F 04 06 (TRACK AXIS OPTION) LOAD 00002 IN R2 PRO F 06 18 (COMPUTED R,P,Y) COPY R,P,Y KEY V34E P00	
(119+55)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)			KEY V37E00E KEY V47E (TRANSFER CSM SV FROM LM SLOTS TO CSM SLOTS)	
(120+00)	PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 3 SETS OF 3 MARKS EACH (ADDENDUM 4)	(P23)	(121+30)	PROCEDURES FOR EXT DV TARGETING (ADDENDUM 9)	(P30)
	RECOMMENDED NAV STARS NO. 22 (REGULUS) (FAR HOR) NO. 26 (SPICA) (NEAR HOR) NO. 31 (ARCTURIUS) (NEAR HOR)			***** PROPULSION SYSTEM SELECTION	*****

USE RCS FOR DV LESS THAN 0.1  
 EQUAL TO 12FPS  
 USE SPS FOR DV GREATER  
 THAN 12FPS

TRIM DVS TO ZERO  
 \*\*\*\*\*

PROCEDURES FOR SM RCS PROPULSION  
 MONITOR CHECKS  
 (ADDENDUM 10)

PROCEDURES FOR RCS THRUST SET-UP  
 (ADDENDUM 12)

SECOND TRANSEARTH MIDCOURSE

PROCEDURES FOR SM RCS AND SPS  
 PROPULSION MONITOR CHECKS  
 (ADDENDUM 10)

PROCEDURES FOR STAR/LUNAR  
 HORIZON SIGHTINGS - 3 SETS  
 OF 3 MARKS EACH  
 (ADDENDUM 4)

RECOMMENDED NAV STARS  
 NO. 2 (DIPHA) (NEAR HOR)  
 NO. 2 (DIPHA) (NEAR HOR)  
 NO. 1 (ALPHERATZ) (NEAR HOR)

PROCEDURES FOR STAR/EARTH  
 HORIZON SIGHTINGS - 5 SETS  
 OF 3 MARKS EACH  
 (ADDENDUM 4)  
 RECOMMENDED NAV STARS  
 NO. 22 (REGULUS) (FAR HOR)  
 NO. 22 (REGULUS) (FAR HOR)  
 NO. 26 (SPICA) (NEAR HOR)  
 NO. 31 (ARCTURUS) (NEAR HOR)  
 NO. 31 (ARCTURUS) (NEAR HOR)

PROCEDURES FOR ESTABLISHING PTC  
 (ADDENDUM 13)

PROCEDURES FOR RETURN TO  
 EARTH TARGETING  
 (ADDENDUM 6)

PROCEDURES FOR TERMINATING PTC  
 ADDENDUM 14)

PROCEDURES FOR IMU REALIGN  
 TO REFMMAT  
 (ADDENDUM 2)

BACKUP ALIGN NAV STARS  
 NO. 14 (CANOPUS)  
 NO. 12 (RIGEL)  
 BACKUP ALIGN CHECK NAV STARS  
 NO. 15 (SIRIUS)

(129+55) PROCEDURES FOR GNC ALIGN TO LUNAR  
(ADDENDUM 3)

(EI-17HRS)

(130+00) PROCEDURES FOR STAR/LUNAR  
HORIZON SIGHTINGS - 2 SETS  
OF 3 MARKS EACH  
(ADDENDUM 4) (P21)

RECOMMENDED NAV STARS  
NO. 2 (DIPHA) (NEAR HOR)  
NO. 2 (DIPHA) (NEAR HOR)

(FI-16HRS)

(130+50) PROCEDURES FOR STAR/EARTH  
HORIZON SIGHTINGS - 6 SETS  
OF 3 MARKS EACH  
(ADDENDUM 4) (P21)

RECOMMENDED NAV STARS  
NO. 22 (REGULUS)  
NO. 22 (REGULUS)  
NO. 26 (SPICA)  
NO. 24 (SPICA)  
NO. 31 (ARCTURUS)  
NO. 31 (ARCTURUS)

(131+50) PROCEDURES FOR ESTABLISHING PTC  
(ADDENDUM 13)

(131+55) PROCEDURES FOR RETURN TO  
EARTH TARGETING  
(ADDENDUM 5) (P37)

(EI-15HRS)

(132+05) PROCEDURES FOR GND UPLINK  
OF CSM STATE VECTOR  
(UPLINK INTO LM SLOTS ONLY)  
(ADDENDUM 8) (P27)

FOLLOWING GND UPLINK

P00 LEB WHEN COMP I.T-OUT (NO INTEG)  
KEY V96E  
KEY V83E  
F 16 54 (R, ROOT, THETA)  
COPY R AND ROOT  
PRO  
KEY V89E  
F 04 06 (TRACK AXIS OPTION)  
LOAD 00002 IN R2  
PRO  
F 06 1A (COMPUTED R,P,Y)  
COPY R,P,Y  
KEY V34E  
P00 KEY V37E00E

(140+25) PROCEDURES FOR TERMINATING PTC  
(ADDENDUM 14)

(140+30)

[illegible]



(143+25)	PROCEDURES FOR RETURN TO EARTH TARGETING (ADDENDUM 6) ***** ***** *****	(P37)	PROPELLION SYSTEM SELECTION USE RCS FOR DV LESS THAN OR EQUAL TO 12FPS USE SPS FOR DV GREATER THAN 12FPS
(143+30)	PROCEDURES FOR TERMINATING PTC (**ONLY IF COMM AVAILABLE**) (ADDENDUM 14)		TRIM DV TO ZERO *****
(143+30)	PROCEDURES FOR IMU REALIGN TO REFSMMAT (ADDENDUM 2)	(P52)	PROCEDURES FOR SM RCS PROPELLSION MONITOR CHECKS (ADDENDUM 10)
	BACKUP ALIGN NAV STARS NO. 14 (CANOPUS) NO. 12 (RIGEL) BACKUP ALIGN CHECK NAV STAR NO. 15 (SIRIUS)		PROCEDURES FOR RCS THRUST SETUP (ADDENDUM 12) (P41)
(143+45)	PROCEDURES FOR GDC ALIGN TO IMU (ADDENDUM 3)		THIRD TRANSEARTH MIDCOURSE PROCEDURES FOR SM RCS AND SPS PROPELLSION MONITOR CHECKS (ADDENDUM 10)
(143+50)	PROCEDURES FOR GND UPLINK OF SM STATE VECTOR AND P30 TARGET LOAD (ADDENDUM 8)		***** ***** THE FOLLOWING SIGHTING PERIOD REQUIRED ONLY FOR A COMM FAILURE
(144+20)	PROCEDURES FOR EXT DV TARGETING (ADDENDUM 9) ***** ***** *****	(P30)	PROCEDURES FOR STAR/EARTH HORIZON SIGHTINGS - 1 SET OF 3 MARKS (COMM FAILURE ONLY) (ADDENDUM 4) (P23)

RECOMMENDED NAV STAR  
NO. 33 (ANTARES) (NEAR HOR)

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\*\*\*\*\*  
\*\*\*\*\*

(146.75)

CM/SM SEPARATION

(146.50)

ENTRY INTERFACE

# Section 3.2.1

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 \*\*\*\*\*  
 \*\*\*\*\*  
 SUMMARY OF ADDENDUMS  
 \*\*\*\*\*  
 \*\*\*\*\*  
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ADDENDUM 1  
 ASSUMED PRE-SEP SC CONFIGURATION

ADDENDUM 2  
 IMU ALIGN (OR REALIGN) (P52)

ADDENDUM 3  
 GDC ALIGN TO IMU

ADDENDUM 4  
 STAR/EARTH (OR LUNAR) HORIZON  
 (OR LANDMARK) SIGHTINGS (P23)

ADDENDUM 5  
 GROUND TRACK DETERMINATION (P21)

ADDENDUM 6  
 RETURN TO EARTH TARGETING (P37)

ADDENDUM 7  
 GDC DRIFT CHECK

ADDENDUM 8  
 GND UPLINK (P27)

ADDENDUM 9  
 EXTERNAL OV TARGETING (P30)

ADDENDUM 10  
 SM RCS AND SPS PROPUSSION CHECKS

ADDENDUM 11  
 SPS THRUST SETUP (P40)

ADDENDUM 12  
 RCS THRUST SETUP (P41)

ADDENDUM 13  
 ESTABLISH PTC

ADDENDUM 14  
 TERMINATE PTC

ADDENDUM 15  
 ORBITAL NAVIGATION PROCEDURES (P22)  
 (PSEUDO LANDING SITE TRACKING)

ADDENDUM 16  
 ORBITAL NAVIGATION PROCEDURES (P22)  
 (LANDMARK TRACKING-NO AUTO OPTICS)

ADDENDUM 17  
 ORBITAL NAVIGATION PROCEDURES (P22)  
 (LANDMARK TRACKING-WITH AUTO OPT)

ADDENDUM 18  
 ORDEAL INITIALIZATION/VERIFICATION

ADDENDUM 19  
 HIGH GAIN ANT ACQUISITION

Section 3.2.2

\*\*\*\*\*  
 ADDENDUM 1  
 ASSUMED PRE-SEP SC CONFIGURATION  
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DISPATCH PROCEDURES  
 PLANET  
 C R F W  
 CR\*\*ASSUMED SWITCH POSITIONS\*\*

CMC ATT-IMU  
 FDAI SCALE-5/1  
 FDAI SELECT-1/2  
 FDAI SOURCE-CMC  
 ATT SET-GUC  
 MAN ATT(3)-RATE CMD  
 LIMIT CYCLE-OFF  
 ATT DB-MAX  
 RATE-LOW  
 THC LOCKED  
 RHC-LOCKED  
 TRANS CONT PWR-OFF  
 RHC PWR NORM(BOTH)-AC/DC  
 RHC PWR DIRECT(ROTH)-OFF  
 SC CONT-CMC  
 CMC MODE-FREE  
 RMAG MODE(3)-RATE 2  
 SPS THRUST DIRECT-NORMAL  
 DV THRUST(A,R)-OFF  
 SCS TVC(2)-AUTO

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FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 1968

SPS GMBL MTR(4)-OFF  
 DV CR-CSM  
 ELS LOGIC-OFF  
 ELS AUTO-MAN  
 CM RCS LOGIC-OFF  
 CM PRPLNT DUMP-OFF  
 CM PRPLNT PURG-OFF(DOWN)  
 IMU CAGE-OFF  
 EMS ROLL-OFF  
 .05 G-OFF  
 LV/SPS IND(2)-PC,GPI  
 TVC GMBL DRIVE(BOTH)-AUTO  
 FCSM(A,R)-RESET/OVERRIDE  
 EMS FUNCTION-OFF  
 EMS MODE-STBY  
 COAS PWR-ON  
 UTIL PWR-ON  
 PL BCN LT-OFF(CENTER)  
 PL DYE MARKER-OFF(DOWN)  
 PL VENT-OFF  
 IUP TLM(CM,IU)-BLOCK  
 RCS TRNFR-SM  
 PANEL 8 CB CLOSED EXCEPT  
 ELS BAT A,BAT B(2)-OPEN  
 SECS ARM(BOTH)-OPEN  
 SECS LOGIC(BOTH)-OPEN  
 PL VENT FLT/PL-OPEN  
 FLOAT BAG(3)-OPEN  
 RCS LOGIC(2)-OPEN  
 AUTO RCS SEL(16)-OFF  
 FLOAT BAG(ALL)-VENT  
 SECS LOGIC(BOTH)-OFF  
 SECS PYRO ARM(2)-SAFE

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FDS PWR-OFF 7  
 TVC SERVO PWR(2)-OFF 7  
 FDOI/GPI PWR-BOTH 7  
 LOGIC PWR 2/3-ON(UP) 7  
 SCS ELEC PWR-GNC/ECA 7  
 SIG CONDR/DR BTAS(2)-AC1 7  
 RMAG PWR(BOTH)-ON 7

LMP\*\*ASSUMED SWITCH POSITIONS\*\*

G/N PWR-AC1 5  
 MN BUS TIE(2)-OFF 5  
 BATT CHGR-AC1 5  
 NONESS BUS-MNB 5  
 PANEL 5 G/N CB(10)-CLOSED 5  
 PANEL 229 CB CLOSED EXCEPT 229  
 MN REL PYRO(2)-OPEN 229  
 S-RAND ANT OMNI- 3  
 SELECT REQD OMNI ANT 3  
 S-RAND NORM MODE VOICF-VOICE 3  
 S-RAND NORM MODE PCM-PCM 3  
 S-RAND NORM MODE RNG-RANGING 3  
 S-BAND AUX TAPE-OFF 3  
 S-BAND AUX TV-OFF 3  
 UP TLM DATA-DATA 3  
 HIP TLM CMD-NORM 3

LEB\*\*ASSUMED SWITCH POSITIONS\*\*

G/N PWR-OPTICS-ON 100  
 G/N PWR IMU-ON 100  
 OPT MODE-MAN 122  
 OPT ZERO-ZERO 122

OPT SPEED-HI 122  
 OPT COUPLING-DIRECT 122  
 OPT TELTRUN-SLAVE TO SXT 122  
 COND LAMPS-ON 122  
 UP TLM(LEB)-ACCEPT 122

\*\*ASSUMED NAP CONFIGURATION\*\*

KEY V46E

F 04 46 (DAP CONFIGURATION)

LOAD 11103  
 11111  
 B

PRO F 06 47 (CSM AND LM WT)

LOAD PAD DATA  
 +XXXXX.  
 +00000.  
 B

PRG F 06 48 (SPS GMBL TRIM)

LOAD PAD DATA  
 +XXX.XX  
 +XXX.XX  
 B

PRO KEY V46E

\*\*ASSUMED PROGRAM CONFIGURATION\*\*

KEY V37E47E

F 16 83 (DVX,DVY,UVZ)  
V32 KEYED FOLLOWING TLI  
CUTOFF

\*\*\*\*\*  
ADDENDUM 2  
IMU ALIGN (OR REALIGN) (P52)  
\*\*\*\*\*

DISPL  
P L A Y S  
P R A  
E O Y  
T G S

C R E W  
P A N E L  
PROCEDURES

\*\*\*PROCEDURES FOR IMU REALIGN\*\*

P00 LMP G/N PWR=AC1  
LEB G/N PWR OPTICS=ON  
OPT ZERO=ZERO (15 SEC)  
OPT ZERO=OFF  
OPT MODE=MAN  
COND LAMPS=ON  
RETICLE BRT TW=ADJUST  
CDR ATT DB=MIN  
RATE=LOW  
LIMIT CYCLE=OFF  
HMAG MODE(3)=ATT1/RATE2  
MAN ATT(3)=RATE CMD  
SC CONT=SCS

P52 LEB KEY V37E52E  
F 04 06 (A) IGN OPTION CODE)  
LOAD 00001 IN R2 FOR ALIGN TO  
UPLINKED PREFERRED REFSMMAT  
AND GO TO F 06 22 DISPLAY  
OR LOAD 00003 FOR REALIGN TO

REFSMAT AND GO TO  
 F 50 25 DISPLAY  
 PRO  
 F 06 22 (R.P.Y AT PROPOSED ALIGNMENT)  
 VERIFY NO GML LOCK AT  
 PROPOSED ALIGNMENT  
 PRO/MONITOR COARSE ALIGN  
 F 50 25 (00015, PERFORM STAR ACQ)  
 RMC-ARMED  
 PRO  
 IF TWO STARS NOT AVAILABLE, A  
 F 05 09 (CODE 405) ALARM  
 WILL OCCUR. COR MANUALLY  
 MANEUVER SC TO ACQUIRE BACKUP  
 ALIGN NAV STARS IN SCT F.V.  
 CMP KEY V32E, RETURN TO  
 F 50 25 (00015) DISPLAY AND PRO  
 IF TWO STARS AVAILABLE AT  
 THIS ALTITUDE  
 F 01 70 (STAR CODE)  
 CHECK FIRST STAR CODE  
 OR LOAD THIRD STAR CODE  
 IF USING ALIGN CHECK  
 OPT MODE-CMC  
 PRO  
 06 92 (SHAFT, TRUN, BLANK)  
 MONITOR OPTICS DRIVE TO  
 STAR ONE  
 (IF VERIFYING SXT DRIVE TO  
 THIRD STAR, KEY V37E00E)  
 IDENTIFY STAR ONE  
 OPT MODE-MAN  
 F 51 88 (PLEASE MARK)  
 MARK ON STAR ONE WITH SXT  
 F 50 25 (00016, TERMINATE MARK SEQ)  
 PRO

9

FINAL MISSION C-PRIME PROCEDURES DATED 12 NOV 196A

F 01 71 (MARKED STAR CODE)  
 PRO  
 F 01 70 (STAR CODE)  
 CHECK SECOND STAR CODE  
 OPT MODE-CMC  
 PRO  
 06 92 (SHAFT, TRUN, BLANK)  
 MONITOR OPTICS DRIVE TO  
 STAR TWO  
 IDENTIFY STAR TWO  
 OPT MODE-MAN  
 F 51 88 (PLEASE MARK)  
 MARK ON STAR TWO WITH SXT  
 F 50 25 (00016, TERMINATE MARK SEQ)  
 PRO  
 F 01 71 (MARKED STAR CODE)  
 PRO  
 F 06 05 (ANGLE DIFF)  
 IF GREATER THAN .05 DEG, KEY  
 V32F, GO TO F 50 25 (00014)  
 AND REPEAT ALIGNMENT  
 IF .05 DEG OR LESS, PRO  
 IF .05 DEG OR LESS, PRO  
 F 06 93 (GYRO TORQ ANGLES)  
 LMF RECORD GYRO TORQ ANGLES  
 VOICF TO GND  
 LEB PRO IF GYRO TORQ ANGLES OK  
 F 50 25 (00014, PERFORM FINE ALIGN)  
 IF REPEAT ALIGNMENT REQUIRED,  
 PRO, RETURN TO F 50 25 (00015),  
 VERIFY STAR ID AND REPEAT  
 MARK PROCESS ON TWO STARS  
 IF ONLY ALIGN CHECK REQUIRED,  
 PRO, RETURN TO F 50 25 (00015),  
 KEY ENTER, GO TO F 01 70,  
 AND VERIFY SXT DRIVES TO  
 THIRD STAR

10

49

P00

ICALLED AFTER THIRD STAR (HW)  
OPT MODE-MAN  
DRIVE TRUN TO LESS THAN 5 DEG  
OPT ZERO-ZERO  
RETICLE BRT TW-MIN BRTNES

P00  
G R A C  
E O L S  
T G Y S

P L A C  
R A R  
E E W

PROCEDURES

P A N E L

\*\*\*\*\*  
ADDENDUM 3  
GDC ALIGN TO IMU  
\*\*\*\*\*

\*\*PROCEDURES FOR GDC ALIGN TO IMU\*\*

P00

COR ATT DB-MIN

RATE-LOW

BMAG MODE(3)-ATT1/RATE2

MAN ATT(3)-RATE CMD

SC CONT-SCS

FDAI SELECT-1

FDAI SOURCE-ATT SET

ATT SET-IMU

KEY V16N20E

16 20 (CURRENT R,P,Y)

NULL ATT ERROR NEEDLES

ON FDAI 1 WITH

ATT SET THUMBWHEELS

(AVOID FALSE NULL RY

COMPARING ATT SET IND

WITH N20)

ATT SET-GDC

DEPRESS GDC ALIGN BUTTON

FDAI SELECT 1/2

ATT DB-MAX

11

FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 196A

50

12



\*\*\*\*\*  
 ADDENDUM 4  
 STAR/EARTH(OR LUNAR) HOR (P23)  
 (OR LMK SIGHTINGS)  
 \*\*\*\*\*

DISP  
 PLAY  
 PGR  
 EUG  
 TGS

CR  
 EW  
 PROCEDURES  
 P  
 A  
 N  
 E  
 L

\*\*\*PROCEDURES FOR CISELUNAR NAV\*\*\*

P00 LMP G/N PWR-AC1  
 TLM INPUTS PCM-LOW  
 UP TLM CMD-RESET THEN NORM  
 TAPE RCUR PCM-PCM/ANLG  
 TAPE RCDR RCD-RCD  
 TAPE RCDR FWD-FWD  
 TAPE MOTION TB-BP  
 LEB G/N PWR,OPTICS-ON(OPTICS PWR  
 MUST BE ON AT LEAST  
 30 MIN PRIOR TO TAKING MARKS)  
 OPT ZERO-ZERO(15SEC)  
 OPT TELTRUN-SLAVE TO SXT  
 COND LAMPS-ON  
 OPT MODE-MAN  
 RETCL BRT TW-ADJUST  
 CDR SC CONT-CMC  
 CMC NONE-AUTO  
 BMAG MODE(3)-RATE2  
 MAN ATT(3)-RATE CMD

P23

F 05 70 KEY V37E23L  
(MEASUREMENT IDENTIFICATION)  
LOAD

000XX STAR ID

XXXXX LMK ID

00XX0 HOR ID

FOR HOR MARKS, R2=00000

AND LOAD HOR DATA IN R3

FOR LMK MARKS, R3=00000

AND LOAD LMK DATA IN R2

(ASSUMED ALL KNOWN LMKs)

PRO

F 50 25 (00202, PERFORM AUTO MANEUVER)  
KEY ENTER

F 59 88 (PERFORM CALIBRATION MARK)  
CALIBRATION OF OPTICS TRUNION  
REQUIRED AT THE BEGINNING  
OF EACH SIGHTING PERIOD.  
IF OPTICS CALIBRATION ALREADY  
PERFORMED,

OPT MODE-CMC

OPT ZERO-OFF

KEY ENTER AND GO TO

06 92 DISPLAY

IF OPTICS CALIBRATION REQUIRED

OPT MODE-MAN

RMC 2-ARMED

MANEUVER SC TO ACQUIRE A CTAP

WITH THE S.T LMK LOS

CDR CMC MODE-FREE

LER FIX STAR IN SXT LMK LOS FIELD

OF VIEW WITH MIN IMP CONTRAST

OPT ZERO-OFF

OPT COUPLING-RSLV

OPT SPEED-LOW

15

FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 1968

F 06 87 SUPERIMPOSE SXT STAR LOS  
(BLANK, TRUN ANGLE BIAS, BLANK)  
ON SXT LMK LOS WITH THE  
OPTICS HAND CONTROLLER  
MARK WHEN THE TWO LINES OF  
SIGHT ARE SUPERIMPOSED  
COPY TRUN ANGLE BIAS  
KEY V32E

F 59 88 (PERFORM CALIBRATION MARK)  
SUPERIMPOSE SXT STAR LOS  
ON THE SXT LMK LOS  
MARK WHEN THE TWO LINES OF  
SIGHT ARE SUPERIMPOSED

F 06 87 (BLANK, TRUN ANGLE BIAS, BLANK)  
COPY TRUN ANGLE BIAS  
IF THE TWO TRUN ANGLE BIAS  
MEASUREMENTS ARE NOT WITHIN  
.003 DEG.

KEY V32E AND REPEAT THE  
CALIBRATION PROCESS  
IF ANY TWO TRUN ANGLE BIAS  
MEASUREMENTS ARE  
WITHIN .003 DEG.

PRO (INCORPORATE TRUN BIAS)  
(PLEASE MARK)

F 51 88 KEY V94E (PERFORM LMK (HOR)  
ACQUISITION)

F 50 18 (COMMANDED R,P,Y ANGLES)

CDR SC CONT-CMC

CMC MODE-AUTO

LER PRO

06 18 (COMMANDED R,P,Y ANGLES)

CDR MONITOR AUTOMATIC MANEUVER

FOR GIMBAL LOCK

LER MONITOR AUTO MANEUVER, VERIFY

LMK/HOR IN SXT FIELD OF VIEW

16

52

F 50 18 (COMMANDED R.P.Y ANGLES)

OPT MODE-CMC

KEY ENTER

06 92 (COMMANDED OPTICS ANGLES)

MONITOR OPTICS DRIVE

TO SELECTED STAR

OPT MODE-MAN

F 51 88 (PLEASE MARK ON STAR-LMK/HOR)

CDR CMC MODE-FREE

LER MANUEVER SC WITH MIN TMP

CONTROLLER TO POSITION

LMK(HOR) IN SXT AT

SIX STELLAR POINT

FIX LMK(HOR) IN SXT

OPT COUPLING-RSLV

OPT SPEED-LO

MANUEVER OPTICS TO SUPERIMPOSE

STAR ON LMK/HOR

MARK ON STAR-LMK/HOR

F 50 25 (00016, TERMINATE MARK SEQ)

PRO

F 05 71 (MEASUREMENT IDENTIFICATION)

VERIFY MARKED DATA

PRO

F 06 49 (DR.DV, BLANK)

\*\*HOLD AT THIS DISPLAY FOR

20 SECONDS\*\*

KEY VOINOLE 362E

CCPY TRUN (OCTAL) IN R1

\*\*HOLD AT THIS DISPLAY FOR

20 SECONDS\*\*

KEY RELEASE

F 06 49 (DR.DV, BLANK)

PRO IF DR AND DV ACCEPTABLE

OR IF NOT ACCEPTABLE

KEY V32E, RETURN TO F 05 70

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FINAL MISSION C-PP'WE PROCEDURES DATED-12 NOV 1968

DISPLAY, AND REPEAT MARK

F 37 88

TAKE 2 ADDITIONAL MARKS ON

EACH STAR/LMK(HOR) SET

KEY 23E, RETURN TO

F 05 70 DISPLAY

AND REPEAT MARK PROCESS

WHEN SELECTING A NEW

STAR/LMK(HOR) SET TO MARK ON

KEY 23E, RETURN TO THE

F 05 70 DISPLAY PERFORM THE

REQUIRED ATT MANUEVER, AND

TAKE THREE MARKS ON THE SET

WHEN TERMINATING THE NAV

SIGHTING PERIOD

KEY 00E

OPT MODE-MAN

DRIVE TRUN LESS THAN 5 DEG

OPT ZERO-ZERO

RETICLE BRT 7X-MIN RTNESS

CMC MODE-AUTO

CDR IF TAPE RCDR OPERATING

TAPE RCDR FWD-OFF(CTR)

TAPE MOTION TB-GRAY

(ASSUME GND PLAYBACK AT

NEXT OPPORTUNITY)

18

83

\*\*\*\*\*  
 ADDENDUM 5  
 GROUND TRACK DETERMINATION (P21)  
 \*\*\*\*\*

P L C  
 G R A R  
 E O Y E W  
 T G S PROCEDURES  
  
 P00  
 P21 CMP KEY V37E21E  
 F 04 06 (00002,VEHICLE OPTION)  
 LOAD 00001 IN R2  
 PRO  
 F 05 34 (T LAT AND LONG)  
 LOAD NOMINAL TIME OF  
 LO11 RECEIVED FROM GND  
 PRO  
 F 06 43 (LAT, LONG, ALT)  
 COPY LAT, LONG, AND ALT  
 IF A 10MIN INCREMENT FROM THE  
 LOADED TIME IS DESIRED,  
 KEY V32E AND RETURN TO  
 F 06 34 DISPLAY (TIME IS  
 AUTOMATICALLY INCREMENTED)  
 IF PROGRAM TERMINATION  
 IS DESIRED,  
 PRO  
 F 37 88 KEY 00E  
 P00

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FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 1964

\*\*\*\*\*  
 ADDENDUM 6  
 RETURN TO EARTH TARGETING (P37)  
 \*\*\*\*\*

P00  
 P37 \*\*PROCEDURES FOR RETURN TO  
 EARTH TARGETING \*  
  
 CMP KEY V37E37E  
 F 06 33 (TIG OF MIDCOURSE)  
 LOAD TIG (GET) OF MIDCOURSE  
 PRO  
 F 06 60 (BLANK, VPRED, GAMMA EI)  
 LOAD ZERO IN R2 (VPRED) AND  
 LOAD ZERO IN R3 (GAMMA EI)  
 PRO  
 KEY V16N38E, MONITOR ITERATION  
 KEY RELEASE WHEN KEY REL LT-ON  
 IF F 06 09 ALARM 612, 605, OR  
 613 OCCUR, KEY V32E, GO TO  
 F 06 33 DISPLAY, AND ADJUST  
 INPUT PARAMETERS  
 F 06 61 (IMPACT LAT, IMPACT LONG, BLANK)  
 COPY LAT AND LONG AND IF NOT  
 ACCEPTABLE, KEY V32E, GO TO  
 F 06 33 DISPLAY, AND ADJUST  
 INPUT PARAMETERS  
 PRO IF ACCEPTABLE  
 F 06 39 (DELTA T TRANSFER)  
 COPY DELTA T TRANSFER (GET)  
 AND IF NOT ACCEPTABLE, KEY  
 V32E, GO TO F 06 33 DISPLAY,  
 AND ADJUST INPUT PARAMETERS  
 PRO IF ACCEPTABLE  
 F 06 60 (BLANK, VPRED, GAMMA EI)

20

54

COPY VPRED AND GAMMA FI AND  
 IF NOT ACCEPTABLE,KEY V32F,  
 GO TO F 06 33 DISPLAY,AND  
 ADJUST INPUT PARAMETERS  
 PRO IF ACCEPTABLE  
 F 06 81 (DELTA VX,VY,VZ=LOCAL VERT)  
 COPY DVS  
 PRO  
 IF F 05 09 ALARM 605 OR 613  
 OCCUR,KEY V32F,GO TO F 04 37  
 DISPLAY,AND ADJUST  
 INPUT PARAMETERS  
 F 06 61 (IMPACT LAT,IMPACT LONG,B,ANK)  
 COPY PRECISION IMPACT  
 LAT AND LONG  
 IF NOT ACCEPTABLE,KEY V32F,  
 RETURN TO F 06 33 DISPLAY,  
 AND ADJUST INPUT PARAMETERS  
 PRO IF ACCEPTABLE  
 F 06 39 (DELTA T TRANSFER)  
 COPY PRECISION DELTA T  
 TRANSFER  
 IF NOT ACCEPTABLE,KEY V32F,  
 GO TO F 06 33 DISPLAY,AND  
 ADJUST INPUT PARAMETERS  
 PRO IF ACCEPTABLE  
 F 06 60 (BLANK,VPRED,GAMMA EI)  
 COPY PRECISION VPRED  
 AND GAMMA EI  
 IF NOT ACCEPTABLE,KEY V32F,  
 GO TO F 06 33 DISPLAY,AND  
 ADJUST INPUT PARAMETERS  
 PRO IF ACCEPTABLE  
 F 06 81 (DELTA VX,VY,VZ=LOCAL VERT)  
 COPY PRECISION DELTA V  
 PRO

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FINAL MISSION C-PRIME PROCEDURES DATED 12 NOV 196A

F 04 06 (00007,00001,BLANK)  
 VERIFY R2=00001 FOR SPS OR  
 LOAD R2=00002 FOR RCS  
 PRO  
 F 06 33 (TIG OF MIDCOURSE)  
 COPY TIG OF MIDCOURSE  
 ADJUSTED FOR FINITE  
 BURN TIME  
 PRO  
 F 16 45 (MKS,TFI,MGA)  
 COPY MGA  
 PRO  
 F 37 BB KEY ONE  
 P00

22

55

LMP RECORD DRIFT DATA AND  
VOICE TO GND  
COR ATT DB-MAX  
FDAI SEL-1/2  
ATT SET-IMU

\*\*\*\*\*  
APPENDUM 7  
GDC DRIFT CHECK  
\*\*\*\*\*

DISPLANCE  
PLANCE  
GRACE  
TGS  
C  
R  
E  
W  
PROCEDURES  
P  
A  
N  
E  
L

\*\*\*PROCEDURES FOR GDC DRIFT TEST\*\*\*

P00 COR ATT DB-MIN  
RATE-LOW  
RMAG MODE(13)-ATT1/RATE2  
MAN ATT(13)-RATE CMD  
SC CONT-SCS  
KEY V06N20E  
06 20 (R,P,Y)  
FDAI SELECT-1  
FDAI SOURCE-ATT SET  
ATT SET-GDC  
NULL ATT ERROR NEEDLES  
ON FDAI 1 WITH  
ATT SET THUMBWHEELS  
(AVOID FALSE NULL BY  
COMPARING ATT SET IND  
WITH N20)  
KEY ENTER WHEN FDAI ERROR  
NEEDLES NULLEN  
READ DSKY N20 AND ATT SET  
VALUES AND CONFIRM DRIFT  
LESS THAN 10 DEG PER HR

\*\*\*\*\*  
 ADDENDUM 8  
 GND UPLINK  
 \*\*\*\*\*  
 (P27)  
 \*\*\*\*\*

P  
G R A  
E O Y  
T G S

P  
A  
N  
E  
L

C  
R  
E  
W  
P  
R  
O  
C  
E  
D  
U  
R  
E  
S

\*\*\*PROCEDURES FOR GND UPLINK\*\*

P00 CMP KEY V37E00E  
 CDR UP TLM(CM) (MDC)-ACCEPT  
 P27 CMP MONITOR UPLINK ACT LT-ON  
 MONITOR GND UPLINK  
 MONITOR UPLINK ACT LT-OFF  
 P00 LMP RECORD VOICE SV AND MANEUVER  
 PAD DATA  
 CDR UP TLM(CM) (MDC)-BLOCK

\*\*\*\*\*  
 ADDENDUM 9  
 EXTERNAL DV TARGETING  
 \*\*\*\*\*  
 (P30)  
 \*\*\*\*\*

D  
I  
S  
P  
L  
A  
Y  
S

P  
A  
N  
E  
L

C  
R  
E  
W  
P  
R  
O  
C  
E  
D  
U  
R  
E  
S

\*\*\*PROCEDURES FOR EXT DV TARGETING\*\*

P30 LEB KEY V37E30E  
 F 06 33 (GETI OF BURN)  
 VERIFY GND GETI  
 PRO  
 F 06 81 (VG - LV)  
 VERIFY GND DVX,DVY,DVZ  
 PRO  
 F 06 42 (HA,HP,VG)  
 COPY VG/COMPARE WITH PAD DVY  
 PRO  
 F 16 45 (MKS,TFI,MGA)  
 CDR SET MDC ET COUNT DWN  
 CONFIRM MGA LESS THAN 45 DEG  
 LEB PRO  
 F 37 88

P00 KEY 00E

\*\*\*\*\*  
 ADDENDUM 10  
 SM RCS AND SPS PROPULSION CHECKS  
 \*\*\*\*\*

C T S P  
 P L A C  
 G R Y R  
 E O Y E  
 Y G S W

P A N E L

PROCEDURES

\*\*PROC FOR SM RCS MONITOR CHECK\*\*

SM RCS HE TB(8)-GRAY 2  
 SM RCS PRIM PRPLNT TB(4)-GRAY 2  
 SM RCS SEC PRPLNT TB(4)-GRAY 2  
 RCS IND SEL-SM A.B.C.D 2  
 CHECK QUADS A.B.C.D 2  
 SM RCS PKG TEMP 2  
 IND-105-195 DEG 2  
 SM RCS HE PRESS IND-RECORD  
 SM RCS IND SW-HE TK TEMP  
 SM RCS HE TK TEMP  
 IND-RECORD  
 SM RCS IND SW-PRPLNT QTY  
 SM RCS PRPLNT QTY  
 IND-RECORD  
 SM RCS MANF PRESS  
 IND-178-192PSIA  
 WHEN SM RCS MANF PRESS 2  
 IND <150PSIA  
 RCS SEC FUEL PRESS  
 (A.B.C.D)-OPEN

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FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 1968

\*\*PROC FOR SPS MONITORING CHECK\*\*

SPS PRPLNT TK TEMP IND  
 \*53 TO \*75 DEG  
 IF <55DEG, SPS LINE HTS-A  
 IF >75DEG, SPS LINE HTS-OFF  
 SPS PRESS IND SW-HE.N2A.N2B 3  
 SPS HE/N2 PRESS IND 3  
 SPS HE PRESS-3900PSIA MAX  
 SPS N2A PRESS-2900PSIA MAX  
 SPS N2B PRESS-2900PSIA MAX 3  
 SPS PRESS IND SW-HE 3  
 SPS FUEL AND OXID PRESS 3  
 IND-170-195PSIA  
 (FUEL/OXID MAX DELTAP=20PSIA)  
 SPS ENG INJ VLV IND(4)-CLOSE 3  
 RECORD 3  
 SPS OXID QTY IND  
 SPS FUEL QTY IND  
 SPS OXID UNBAL IND  
 OXID FLOW VLV PRIM-PRIM 3  
 SPS HE VLV(BOTH)-AUTO 3  
 SPS HE VLV TB(BOTH)-BP 3

28

58



\*\*\*\*\*  
 ADDENDUM 11  
 SPS THRUST SETUP  
 \*\*\*\*\*

(P40)  
 \*\*\*\*\*

P  
 G R A C  
 E O Y R  
 T G S E  
 W

PROCEDURES

\*\*PROCEDURES FOR SPS THRUST\*\*

LEB KEY V37E00E  
 CDR CONFIRM GND P144 BIAS CHECK

\*\*PROCEDURES FOR EMS TEST AND e/U\*\*

CDR CR,EMS(2)/CLOSED  
 SC CONT=CMC  
 CMC MODE=FREE  
 EMS MODE=STBY  
 EMS FUNCTION=OFF  
 EMS FUNCTION=DV  
 EMS MODE=AUTO  
 VERIFY DV LESS THAN  
 3.27PS PER 10NSEC  
 CMC MODE=AUTO  
 EMS FUNCTION=OFF  
 EMS MODE=STBY  
 EMS FUNCTION=DV SET  
 EMS MODE=AUTO  
 LOAD DV = 1586.8

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EMS FUNCTION=DV TEST  
 MONITOR SPS LT-ON  
 MONITOR DV COUNTDOWN  
 MONITOR SPS LT-OFF  
 CONFIRM DV = -20.8 +/- 20.7  
 EMS MODE=STBY  
 EMS FUNCTION=DV SET  
 LOAD BURN VC  
 EMS FUNCTION=DV

LEB KEY V49E  
 F 06 22 (FINAL GMBL ANGLES)  
 LOAD BURN R,P,Y GMBL ANGLES  
 KEY V62E

CDR BMAG MODE(3)=RATE2

RMC=ARMED

LEB PRO

F 50 18 (COMMANDED R,P,Y)

PRO

06 18 (COMMANDED R,P,Y)

CDR MONITOR ATT MANEUVER

FOR GMBL LOCK

F 50 18 (COMMANDED R,P,Y)

VERIFY R,P,Y AGREE WITH BURN

PAD R,P,Y WITHIN 5 DEG

LEB KEY ENTER

\*\*PROC FOR SPS THRUST PROG\*\*

P40  
 F 50 18 (COMMANDED R,P,Y)  
 VERIFY R,P,Y AGREE WITH PAD  
 VALUES WITHIN 5 DEG  
 CDR ALIGN SC IN ROLL TO PAD VALUE  
 LEB PRO  
 06 18 (COMMANDED R,P,Y)

30

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CDR MONITOR BURN ATT TRIM  
 F 50 18 (COMMANDED R,P,Y)  
 LEB G/N PWR OPTICS-ON  
 OPT ZERO-ZERO(15SEC)  
 OPT TELTRUN-SLAVE TO SXT  
 RETICLE BRT TW-ADJUST  
 OPT ZERO-OFF  
 OPT MODE-CMC  
 KEY V4ING1E  
 F 21 92 (BLANK,BLANK,BLANK)  
 LOAD PAD SHAFT ANGLE(4XX.XX)  
 IN R1 AND PAD TRUNNION A.GLF  
 (4XX.XX) IN R2  
 41 RB (SHAFT,TRUNNION,BLANK)  
 MONITOR OPT DRIVE TO PAD  
 VALUES  
 F 50 18 (COMMANDED R,P,Y)  
 VERIFY PAD STAR IN SXT  
 OPT MODE-MAN  
 DRIVE TRUNN LESS THAN 5 DEG  
 OPT ZERO-ZERO  
 RETICLE BRT TW-MIN BRTNESS  
 MOVE TO CENTER SEAT  
 LMP MN BUS TIE(2)-ON  
 PLUG MODE-NORM(AUX FOR TEL)  
 SPS HE VLV TR (ROTH)-RP  
 SPS HE VLV (ROTH)-AUTO  
 CDR RHC PWR DIRECT(ROTH)-OFF  
 SC CONT-CMC  
 CMC MODE-AUTO  
 SCS TVC (ROTH)-RATE CMD  
 TVC GMBL DRIVE (2)-AUTO  
 PERFORM MTVC CHECKS  
 TVC SERVO PWR 1-AC 1/MNA  
 TVC SERVO PWR 2-AC 2/MNB  
 TRANS CONTR PWR-ON (UP)  
 RHC PWR NORM 2-AC  
 GMBL MTRS PITCH 1-START-ON  
 GMBL MTRS YAW 1-START-ON  
 THC-CLOCKWISE  
 RHC-VERIFY NO MTVC  
 GMBL MTRS PITCH 2-START ON  
 GMBL MTRS YAW 2-START ON  
 SFT GPI PTRIM TO PAD VALUE  
 YTRIM TO PAD VALUE  
 RHC-VERIFY MTVC  
 THC-NEUTRAL  
 RHC PWR NORM 2-AC/DC  
 ALIGN SC IN ROLL TO PAD VALUE  
 CMC PRO  
 06 18 (COMMANDED R,P,Y)  
 MONITOR ATT TRIM  
 F 50 18 (COMMANDED R,P,Y)  
 VERIFY R,P,Y AGREE WITH PAD  
 VALUES WITHIN 5 DEG  
 KEY ENTER  
 F 50 25 (00204, GMBL DRIVE TEST)  
 CDR RHC PWR DIRECT(ROTH)-MNA/MNB  
 MAN ATT (3)-RATE CMD  
 ATT DR-MIN  
 RATE-HIGH  
 RMAG MODE (3)-ATT1/RATE 2  
 AUTO RCS SEL(16)-MNA  
 \*\*ALIGN GNC TO IMU\*\*  
 CDR FDOI SELECT 1  
 FDOI SOURCE-ATT SET  
 ALT SET-IMU  
 CMC KEY V16N20E  
 F 16 20 (R,P,Y)  
 CDR NULL FDOI NEEDLES WITH

ATT SET TW (AVOID FALSE  
NULL RY COMPARING ATT SET  
IND WITH N20)  
ATT SET-GDC  
DEPRESS GDC ALIGN PB  
FDAI SELECT-1/2  
CMP KEY RELEASE  
F 50 25 (00204, GMBL DRIVE TEST)  
CMP PRO  
CDR MONITOR GMBL DRIVE  
SEQ AND TRIM  
06 40 (TFI, VG, DVM)  
VERIFY SPS GPI TRIM AGREES  
WITH PAD WITHIN 0.5 DEG  
-2MIN LMP NONESS BUS-MNA  
TAPE RCDR FWD-OFF(CTR)  
TLM INPUTS PCM-HIGH  
UP TLM CMD-RESET THEN NORM  
TAPE RCDR PCM-PCM/ANLG  
TAPE RCDR RCD-RCD  
TAPE RCDR FWD-FWD  
TAPE MOTION TB-RP  
FLT RCDR-MECORD  
(FOR LOI1, LOI2, AND TEI)  
CDR FDAI SCALE-5/5  
VERIFY SPS TH LT-OFF  
CB SPS P2-OPEN(TEI ONLY)  
CB SPS Y2-OPEN(TEI ONLY)  
DV THRUST(BOTH)-NORMAL  
THC-ARMED  
RHC-ARMED  
DSKY BLANKS  
06 40 (TFI, VG, DVM)  
CDR EMS MODE-AUTO  
-25 CMP CK DVM FOR HI PIPA BIAS

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-15 CDR APPLY ULLAGE THRUST  
(IF RQUIRED)  
-5 F 99 40 (REQUEST FOR ENGINE ENABLE)  
CMP PRO  
0 06 40 (TFC, VG, DVM)  
+1 CDR MONITOR SPS LT-ON/START  
MDC ET COUNT UP  
TERMINATE ULLAGE 1 SEC  
AFTER SPS IGNITION  
CONFIRM FDAI 1 RATES LESS THAN  
10 DEG/SEC  
MONITOR PC GAUGE 95-105 PSIA  
VERIFY VG/DECR AND DVM/INCR  
CMP MONITOR FDAI 2 RATES LESS THAN  
10 DEG/SEC  
LMP MONITOR VALVES OPEN AND  
SPS GAUGES  
CDR MONITOR SPS ENGINE CUTOFF  
MONITOR SPS LT-OFF  
F 16 40 (TFC, VG, DVM) (COPY VG AND DVM)  
CUTOFF+1SEC DV THRUST(BOTH)-OFF  
MONITOR PC GAUGE ZERO  
LMP MONITOR VALVES CLOSED  
SPS HE VLV TB(BOTH)-BP  
FLT RCDR-OFF(CTR)  
CDR CB SPS P2-CLOSED  
CB SPS Y2-CLOSED  
SPS GMBL MTRS(4)-ONF  
(SEQUENTIALLY-P2, Y2, P1, Y1)  
TVC SERVO PWR(BOTH)-OFF  
(SEQUENTIALLY-2, 1)  
CMP PRO  
F 16 85 (VG-BODY)  
CDR NULL VG RESIDUALS AS READ  
THC-LOCKED

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\*\*\*\*\*  
 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
 \*\*\*\*\*

RHC-LOCKED  
 CMP PRO  
 F 37 88

\*\*\*\*\*  
 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
 \*\*\*\*\*

RHC-LOCKED

CMP PRO

F 37 88

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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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P00

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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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LMP NONESS BUS-OFF  
 TAPE RCOR FWD-OFF (CTR)  
 TAPE MOTION TB-GRAY  
 (ASSUME GND PLAYRACK AT  
 NEXT OPPORTUNITY)

\*\*\*\*\*  
 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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COR

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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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TRANS CONT PWR-OFF  
 RHC PWR DIRECT (RTH)-OFF  
 RMAG MODE (3)-RATE 2

DISPLAYS  
 PLAGES  
 GROUND  
 TGS

P00

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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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 ADDENDUM 12  
 RCS THRUST SETUP (P41)  
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LEB KEY V49E

F 06 22 (FINAL GMBL ANGLES)  
 LOAD BURN R,P,Y GMBL ANGLES  
 KEY V62E  
 CDR RMAG MODE(3)-RATE2  
 RMC-ARMED  
 LEB PRO  
 F 50 18 (COMMANDED R,P,Y)  
 PRO  
 06 18 (COMMANDED R,P,Y)  
 CDR MONITOR ATT MANFUVER  
 FOR GMBL LOCK  
 F 50 18 (COMMANDED R,P,Y)  
 VERIFY R,P,Y AGREE WITH  
 PAD R,P,Y WITHIN 5 DEG  
 LEB KEY ENTER  
 \*\*PROC FOR RCS THRUST PROG\*\*  
 P41 LEB KEY V37E41E  
 F 50 18 (COMMANDED R,P,Y)  
 CDR ALIGN SC IN ROLL TO PAD VALUF  
 LEB PRO  
 06 18 (COMMANDED R,P,Y)  
 CDR MONITOR BURN ATT TRIM  
 F 50 18 (COMMANDED R,P,Y)  
 VERIFY R,P,Y AGREE WITH PAD  
 VALUES WITHIN 5 DEG  
 LEB OPT MODE-MAN  
 G/N PWR OPTICS-ON  
 OPT ZERO-ZERO(15SEC)  
 OPT TELTRUN-SLAVE TO SXT  
 RETICLE BRT TW-ADJUST  
 OPT ZERO-OFF  
 OPT MODE-CMC  
 KEY V41N91E  
 F 21 92 (BLANK,BLANK,BLANK)

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FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 196A

LOAD PAD SHAFT ANGLF(XXX,XX)  
 IN R1 AND PAD TRUNNION ANGLE  
 (XX,XX) IN R2  
 41 88 (SHAFT,TRUNNION,BLANK)  
 MONITOR OPT DRIVE TO PAD  
 VALUES  
 F 50 18 (COMMANDED R,P,Y)  
 VERIFY PAD STAR IN SXT  
 OPT MODE-MAN  
 DRIVE TRUN LESS THAN 5 DEG  
 OPT ZERO-ZERO  
 RETICLE BRT TW-MIN RTNESS  
 MOVE TO CENTER SEAT  
 KEY ENTER  
 06 85 (VG-RDNY)  
 CDR ATT DR-MIN  
 RATE-LOW  
 RMAG MODE(3)-ATT1/RATE2  
 AUTO RCS SEL(16)-MNA  
 TRANS CONT PWR-ON(UP)  
 \*\*ALIGN GDC TO IMU\*\*  
 CDR FDAI SELECT 1  
 FDAI SOURCE-ATT SET  
 ATT SET-IMU  
 CMP KEY V16N20E  
 16 20 (R,P,Y)  
 CDR NULL FDAI NEEDLES WITH  
 ATT SET TW (AVOID FALSE  
 NULL BY COMPARING ATT SET  
 IND WITH N20)  
 ATT SET-GDC  
 DEPRESS GDC ALIGN PA  
 FDAI SELECT-1/2  
 CMP KEY RELEASE

38

63

EMS FUNCTION-OFF  
ATT NR-MAX  
HMAG MODE(3)-RATE 2  
TRANS CONT PUR-OFF

-2MIN LMP TLM INPUTS PCM-HIGH  
UP TLM CMD-RESET THEN NOR.  
TAPE RCDR PCM-PCM/ANLG  
TAPE RCDR RCD-RCD  
TAPE RCDR FWD-FWD  
TAPE MOTION TB-RP  
DSKY BLANKS  
-35 SEC 16 AS (VG-BODY)  
-30 EMS MODE-AUTO  
-25 SEC CMP KEY N40E  
16 40 (TFI.VG.DVM)  
MONITOR DVM FOR HT PIPA BIAS  
(LESS THAN 2FPS PER 5SEC,  
KEY RELEASE  
COR RMC-ARMED  
THC-ARMED  
-0 F 16 AS (VG-BODY)  
SET MUC ET COUNTING UP AND  
NULL VG AS REQUIRED  
THC-LOCKED  
RMC-LOCKED  
CMP PHO  
F 37 AB

\*\*CALL IDLING PROGRAM\*\*

P00 KEY 00F  
KEY V64E (TRANSFER POST B.I.HN  
SV FROM C.M SLOTS  
TO LM SLOTS)  
LMP TAPE RCDR FWD-OFF(CTR)  
TAPE MOTION TB-GRAY  
(ASSUME GND PLAYBACK AT  
NEXT OPPORTUNITY)  
COR EMS MODE-STBY

\*\*\*\*\*  
 APPENDUM 13  
 ESTABLISH PTC  
 \*\*\*\*\*

DISPLA  
 PROYS  
 PLAG  
 EOTS  
 C R E W  
 P A N E L

PROCEDURES  
 CDR ATT DB-MIN  
 RATE-LOW  
 MAN ATT(3)-RATE CMD  
 BMAG MODE(3)-RATE2  
 SC CONT-CMC  
 CMC MODE-AUTO  
 FDAI SCALE-5/1  
 FDAI SELECT-1/2

CMF KEY VARE  
 F 04 46 (DAP CONFIGURATION)  
 LOAD OR VERIFY  
 1112  
 1111  
 B

PRO  
 F 06 47 (CSM AND LM WT)  
 PRO  
 F 06 48 (SPS GMBL TRIM)  
 PRO

LMP RECEIVE PTC R.P.Y FROM GND  
 OR USE PREVIOUS PTC ANGLES  
 IF STILL VALID.COORDINATE PTC  
 GMBL ANGLE UPDATES WITH GND

CMF KEY V49E  
 F 06 22 (FINAL GMBL ANGLES)  
 LOAD PTC GMBL ANGLES  
 KEY V62E  
 RHC-ARMED  
 PRO  
 F 50 18 (COMMANDED R.P.Y)  
 PRO  
 06 18 (COMMANDED R.P.Y)  
 CDR MONITOR ATT MANEUVER  
 FOR GMBL LOCK  
 F 50 18 (COMMANDED R.P.Y)  
 VERIFY R.P.Y AGREE WITH PTC  
 PAD R.P.Y WITHIN 5 DEG  
 NULL FDAI NEEDLES WITH RHC  
 CMF KEY ENTER

CDR BMAG MODE(3)-ATT1/RATE2  
 SC CONT-SCS  
 AUTO RCS SEL ROLL(8)-MNA  
 CONFIGURE AUTO RCS SEL FOR  
 SINGLE JET PITCH AND YAW  
 (PITCH-(\*)A3,(-)C4)  
 ( YAW-(\*)B3,(-)D4)  
 LIMIT CYCLE-ON(UP)  
 ATT DB-MAX  
 RATE-HIGH  
 BMAG MODE(R)-RATE2  
 MAN ATT(P,Y)-RATE CMD  
 MAN ATT(R)-ACC CMD  
 MANEUVER SC IN ROLL ABOUT THE

BODY X AXIS TO SET UP A  
 .2 DEG/SEC BODY ROLL RATE  
 RHC-LOCKED  
 LMP RECORD PTC START GET IN LOG  
 CDR MAINTAIN PTC ATT TO +/- 2.0 DEG  
 MAINTAIN BODY ROLL RATE TO  
 .2 DEG/SEC +OR- .1 DEG/SEC  
 DURING PERIODS OF PTC

LMP RECORD PTC CORRECTIONS IN LOG  
 IF THE PTC ATTITUDE MUST BE  
 INTERRUPTED AND A NEW ATT  
 SELECTED, NULLING THE NEEDLES  
 WILL RETURN SC TO PTC ATT

\*\*\*\*\*  
 ADDENDUM 14  
 TERMINATE PTC  
 \*\*\*\*\*

DISPLAYS  
 GRAYS  
 P00

CRW PROCEDURES  
 PANEL

CMP KEY V16N20E  
 16 20 (CURRENT R.P.Y)  
 CDR RHC-ARMED  
 LIMIT CYCLE-OFF  
 STOP PTC ROLL AT THE  
 PREFERRED ATTITUDE FOR NAV  
 SIGHTINGS OR AN IMU ALIGNMENT  
 BY SWITCHING  
 MAN ATT(3)-RATE CMN AT THE  
 APPROPRIATE GMRL ANGLES  
 BMAG MODE(3)-ATT1/RATE2  
 RATE-LOW  
 FDOI SELECT-1/2  
 FDOI SCALE-5/1  
 AUTO RCS SEL(16)-MNA  
 LMP RECORD PTC STOP GET IN LOG



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 APPENDUM 15  
 ORBITAL NAVIGATION PROCEDURES (P22)  
 (PSEUDO LANDING SITE TRACKING)  
 \*\*\*\*\*

C I S P  
 P L A Y S  
 G R A F W  
 E O F W  
 T G S  
 P A N E L  
 P A N E L  
 P A N E L

PROCEDURES

LEB KEY V37E22E

P22

F 06 45 (BLANK, BLANK, MAX MGA)

LEB PRO

F 05 70 (LANDMARK CODE)

LOAD 10001 IN R2

LEB OPT ZERO-OFF

OPT MODE-MAN

POSITION TRUNNION TO 35 DEG

OPT MODE-CMC

LEB PRO

06 92 (SHAFT, TRUN, BLANK)

MONITOR OPT DRIVE TO LANDING

SITE

LEB IDENTIFY IDENTIFICATION POINTS  
 IF VISABLE

LEB, CDR WHEN LANDING SITE IDENTIFIED.

START 0.3 DEG/SEC

PITCH RATE

CDR ROLL TO AVOID SHAFT AXIS

WITHIN 10 DEG OF LANDING

45

FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 196A

SITE  
 LEB OPT MODE-MAN  
 F 51 88 (PLEASE MARK)  
 MAKE 5 MARKS-20 SEC APART  
 POSITION TRUNNION TO 5 DEG  
 OPT ZERO-ZERO  
 CDR STOP PITCH RATE  
 LEB PRO  
 F 05 71 (LANDING SITE DATA)  
 VERIFY R2  
 LEB PRO  
 F 06 49 (DELTA R, DELTA V, BLANK)  
 RECORD VALUES  
 \*\*HOLD AT THIS DISPLAY FOR  
 ONE MINUTE\*\*  
 LEB PRO  
 F 05 89 (LAT, LONG/2, ALT)  
 RECORD VALUES  
 \*\*HOLD AT THIS DISPLAY FOR  
 20 SECONDS\*\*  
 LEB KEY V37E00E

46

67

\*\*\*\*\*  
 ADDENDUM 16  
 ORBITAL NAVIGATION PROCEDURES (P22)  
 (LANDMARK TRACKING-NO AUTO OPTICS)  
 \*\*\*\*\*

DISP  
 PLAR  
 GRAY  
 TGS  
 C  
 R  
 E  
 W  
 PROCEDURES  
 P  
 A  
 N  
 E  
 L

LEB KEY V37E22E

F 06 45 (BLANK,BLANK,MAX MGA)

LEB PRO

F 05 70 (LANDMARK CODE)

LOAD 2000 IN R2

LEB OPT ZERO-OFF

OPT MODE-MAN

LFB PRO

F 51 RR (PLEASE MARK)

PLACE OPTICS AT 10 DEG

TRUNNION ANGLE

IDENTIFY IDENTIFICATION POINTS

AT THEIR RESPECTIVE

ACQUISITION TIMES

LEB,CNR WHEN LANDMARK IDENTIFIED-

START 0.3 DEG/SEC

PITCH RATE

CNR ROLL TO AVOID SHAFT AXIS

WITHIN 10 DEG OF LANDM-RK

LEB MAKE 5 MARKS-20 SEC APART

47

FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 196A

POSITION TRUNNION TO 5 DEG  
 OPT ZERO-ZERO  
 CDR STOP PITCH RATE  
 MAN ATT(P)-ACCEL CMD  
 PITCH SC UP TO 5 DEG PITCH  
 AND 0 DEG ROLL W.R.T.  
 LOCAL HORIZONTAL  
 MAN EYT(P)-MIN IMP  
 INITIATE INITIAL PITCH RATE  
 FOR NEXT LANDMARK SIGHTING

LEB PRO

F 05 71 (LANDMARK DATA)

VERIFY R2

LEB PRO

F 06 49 (DELTA R,DELTA V,BLANK)

RECORD VALUES

\*\*HOLD AT THIS DISPLAY FOR  
 20 SECONDS\*\*

LEB PRO

F 06 89 (LAT, LONG/2,ALT)

RECORD VALUES

\*\*HOLD AT THIS DISPLAY FOR  
 20 SECONDS\*\*

LEB KEY V37E00E

P00

48

68



LER KEY V37E00E

P00

\*\*\*\*\*  
ADDENDUM 18  
ORDEAL INITIALIZATION/VERIFICATION  
\*\*\*\*\*

DISPLACES  
PROGRAM  
TGT

PANEL

CR  
EW  
PROCEDURES

\*\*\*PROCEDURES FOR ORDEAL SETUP\*\*\*

CDR SET ORDEAL ON FDAI 1

FDAI/GPI PWR-BOTH  
LOGIC 2/3 PWR-ON  
CMC ATT-IMU  
FDAI SELECT-1/2  
FDAI 1-ORR RATE  
EARTH/LUNAR-LUNAR  
MODE-HOLD/FAST  
KEY V82E

F 04 06 (00002,00001)

PRG

F 16 44 (HA,HP,TFF)

ALT SET-SET ALT TO HA,HP AVG  
PRG

KEY V83E

F 16 54 (R,ROOT,THETA)  
VERIFY 0 DEG YAW  
SLEW FDAI 1 TO THETA  
MODE-OPR/SLOW  
SLEW FDAI PRECISELY

PRO

\*\*\*\*\*  
ADDENDUM 19  
HIGH GAIN ANT ACQUISITION  
\*\*\*\*\*

P00

LMP HI GAIN ANT TRACK-MAN  
HI GAIN ANT BEAM-WIDE

CMP KEY V64E

F 06 51 (RHO,GAMMA,BLANK)

LMP RECORD HI GAIN ANT

GMBL COORDINATES

CMP PRO

LMP HI GAIN ANT POSITION

SET ANT PITCH TO RHO

SET ANT YAW TO GAMMA

S-BAND ANT OMNI-HI GAIN

VERIFY HI GAIN S-BAND

ANT IND GREATER THAN

HALF SCALE

HI GAIN ANT TRACK-

AUTO OR REACO AS REQUIRED

HI GAIN ANT BEAM-AS REQUIRED

53

FINAL MISSION C-PRIME PROCEDURES DATED-12 NOV 1968

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